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AN EPIDEMIC OF NOMA; REPORT OF SIXTEEN CASES.

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Noma is a disease characterized by rapidly developing gangrenous sloughing with frightful destruction of tissue. It is observed almost exclusively in children, and especially betweeen the ages of three and eight.

It fortunately occurs so rarely that many a physician with a large practice never has seen a case, and in large clinics its occurrence is a rarity. Allchin reports that during seven years there were in the East London Hospital for Children only five cases out of a total of 6364 admitted, and that during thirteen years there were only six cases out of a total of 13,000 admitted to the Hospital for Sick Children.

Its place of predilection is the mucous membrane of the mouth—gum or cheek. In its rapidly destructive progress it quickly attacks the periosteum, which soon undergoes gangrenous change, while the greater part of the cheeks, the upper and lower lips, and the eyelids may be destroyed with complete exposure of the mouth and pharynx. This gangrenous process may, however, though much more rarely, affect other parts of the body with the same destructive effect, and cases of noma involving the genitals and ears have been occasionally observed.

The exhaustion which results directly from this great destruction of tissue is so marked that few cases recover. Bruns gives a mortality of 70 per cent. in 413 cases, and Rilliet and Barthez a mortality of 95 per cent. in 21 cases.

It is said to occur in children recovering from acute disease when the sanitary conditions are bad. Henoch attributes to poor food, lack of cleanliness, and unhealthy, damp dwellings the principal predisposing causes, and with such conditions he has seen it follow bronchitis, pneumonia, and dysentery, especially in children with tuberculous tendencies. Measles, scarlet fever, and typhoid are the pathological conditions in the wake of which this disease most commonly develops, and of these measles has been most frequently observed as the precursor.

Osler claims that at least one-half of the cases develop during the convalescence of measles, while Krahn, in an able paper in the *Mittheilungen aus den Grenzgebieten der Medicin und Chirurgie*, 1900, Heft 4 und 5, records 55 out of 133 cases as developing after measles.

Bouley and Caillant found that measles was the antecedent in 41 out of 46 cases.

In April, 1900, an epidemic of measles occurred at the Albany Orphan Asylum, an institution which cares for 450 children of both sexes, ranging in age from two to fifteen years. The type of disease was severe. Among the 173 cases of measles 32 had complications, twelve had pneumonia, five had pneumonia and gangrene, eleven had noma without other complication, four had lesions which were considered to be beginning noma, but in which the process was stopped in its incipiency by thorough cauterization under chloroform.

Of the twelve cases of pneumonia two died; the five children with pneumonia and gangrene all died, while two only of the eleven cases of noma without other complication died.

Of the sixteen cases of noma the mouth alone was affected in four cases, the mouth and other parts, the ear, and vulva in three cases; the vulva alone was attacked in two children, and in seven with other parts. The gangrene involved the rectum alone in three children, and with gangrene of other parts in five children.

Of the fatal cases noma involved the mouth in three children and the rectum in four children. Pneumonia was, however, the direct cause of death in five of these cases, and in the two patients where no pneumonia was present one had noma of the mouth and the other noma of the rectum.

The ages of the children affected ranged from three to twelve years. Two were in their fourth year, five in their fifth, three in their sixth, four in their seventh, one each in the eighth and ninth, three in the tenth, and one in the eleventh, twelfth, and thirteenth years respectively.

The exciting cause of this series of cases is evident, but the predisposing cause is not so apparent. Poor food, unhealthy, damp dwellings, and lack of cleanliness are usually given as the predisposing causes.

This institution is situated on high ground in a very healthy section of the city, with considerable surrounding space. It consists of a main

building of brick, three stories and basement, and three pavilions of wood—two, two stories and basement, and one, one story and basement.

The basement of the main building is occupied by the kitchen, dining-rooms, and bath-rooms. The basements of two of the wooden pavilions were used as school-rooms for about half the boys and girls. Heating is by hot-air furnaces and stoves. Although there were no cellars underneath, no noticeable dampness was evident. All the children slept in the first and second stories. The boys played out-of-doors, while the girls took their exercise in the basement of one of the pavilions.

The character of the food was closely examined, and, although there seemed to be a lack of variety, its nutritive value was high. The average age of the children is eight years, and they were considered each to require 0.5 of the food of a man, or 1750 calories, one-quarter of this amount being taken at breakfast and supper and one-half at dinner. The breakfast consists of coffee (malted barley roasted), milk, sugar, and bread; the dinner of a beef and vegetable stew and bread; the supper of coca, milk, sugar, bread, and cookies.

There has never been any evidence of lack of cleanliness, and the plumbing throughout is excellent. It can, I believe, be truthfully said that the lodging, food, and care of these children are much superior to that which many children of the poor receive in our large cities. That the general hygienic and dietetic conditions have been excellent is evidenced by the fact that the mortality for the last eight years has averaged 19.4 per thousand, and in 1899, the year preceding this epidemic, there were but four deaths for the entire year.

This occurrence of sixteen cases of noma would seem to be entitled to be called an epidemic. That epidemics of noma occur has been generally denied, and in the epidemics reported in the seventeenth, eighteenth, and early part of the nineteenth century the diagnosis is now questioned. The fact, however, that it occurs in institutions in groups indicates its specific character. Savard[1] and Poupart[2] saw an epidemic of noma in the old Hotel Dieu, Paris, in 1699. Martin[3] noted its occurrence in the Charity Hospital of Lyon in 1796, and considered the ravages of the Revolution as an etiological factor. Lund,[4] of Stockholm, in 1765, observed the development of two cases in children kept in a damp room with hygienic surroundings. Cliet[5] reports eight cases in the General Hospital of Lyon, in 1817. Baron[6] saw, in 1816, cases among infants in the Foundling Hospital of Paris. Luming[7] describes two cases of noma occurring in the Institute for Children's Diseases,

[1] Nouveau recueil d'observations chirurgicales, Paris, 1702.
[2] Historie de l'académie royale des sciences, année, 1699.
[3] Recueil dec actes de la Société de Lyon, 1798.
[4] Der K. Schwedischen akademie der Wissenschaften Abhandlungen, 1765.
[5] Compte-Rendu medico-chirurgicale, Lyon, 1823.
[6] Journal de Médecine, T. xxxvi., 1816.
[7] Dublin Hospital Reports, vol. iv., 1827.

Dublin, in 1824. Ryland[1] observed, after an epidemic of measles in Birmingham, in 1837, eight cases of noma of the cheek and three of noma of the genitals. Barthez and Rilliet[2] declare, as a result of the study of the literature and their own experience, that it is not contagious, although they do not think that point completely settled. d'Espine-Picot[3] claims that it is not contagious. Richter[4] could not find a cause in the diet, cleanliness, or nursing, and believes it was due to a miasma. Loschner[5] observed in the Lazarus Child's Hospital in Prague the repeated occurrence of noma in the room where the first noma case occurred. Bruns[6] believes that the miasmatic or contagious origin and development has not been determined with sufficient certainty. Gierke reports twenty cases of noma occurring in the Child's Hospital in Stettin during seventeen years. Six of these cases developed after the admission of two cases of noma. The general hygienic conditions were good, and he believes it was impossible for it to have been due to such conditions. During an epidemic of measles in the New York Foundling Asylum, in 1891, seven cases occurred among 165 children sick with measles. The misuse of mercury was supposed, however, to have had much influence in inducing this complication.

In the sixteen cases here reported all the cases developed in the girls' dormitory, except two cases in boys who were in the infirmary, where cases of gangrene were being treated. Although there were almost twice as many cases of measles among the boys as among the girls, no cases of noma developed in their dormitory. The first case was detected by the putrid odor coming from the patient. An examination then revealed that the vulva was gangrenous. This process rapidly extended to the rectum, with complete destruction of the intervening tissue. After the discovery of this case the children were carefully examined. The other cases developed in this dormitory where there was the possibility of contagion by soap, towels, etc., and none in the boys' dormitory, although they were under precisely the same hygienic conditions. It was noted, also, that after the cases were thoroughly isolated no new cases developed.

The disease began with a slight ulceration of the mucous membrane with a surrounding area of intense hardness. This quickly became dark, with a dark, brownish-red border, broke down, and had a most offensive odor. The process was in some cases frightfully rapid, so that the tissue seemed to necrose *en masse*. No complaint of pain was made by the children, and the washing and dressing of the ulcerated surfaces did not cause distress.

[1] Lancet, 1838, vol. ii
[2] Manuel Pratique des Maladies de l'Enfance.
[3] Heckars literar Annal, 1829.
[4] Vierteljahrschrift f. d. prakt Heilkunde, 1847.
[5] Die chirurg. Pathologie u. Therapie des Kan. u. Geschmacksorgans, Tübingen, 1859.
[6] Jahrbuch f. Kinderheilkunde, 1868.

The general treatment was stimulating—alcohol, iron, quinine, strychnine, nitroglycerin, and concentrated nourishment. The local treatment was cleanliness, frequent douching with 50 per cent. boric acid solution, then with pure hydrogen dioxide, and constant wet dressings of Labarraque's solution. Where the destruction was not too extensive thorough cauterization under chloroform with the Paquelin cautery seemed to stop the progress of the gangrene, and in four cases not counted in this series the cauterization so completely stopped the process as to render the diagnosis doubtful.

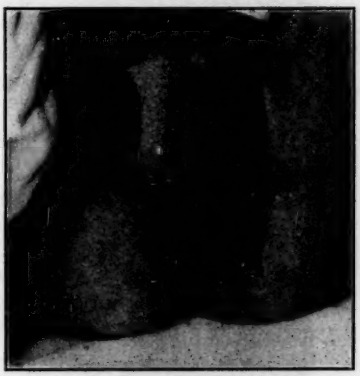
The following histories are typical of the cases observed:

I. B., aged three years, a girl. Family history unknown. (Figs. 1 and 2.) Several days after the disappearance of the rash of measles gangrenous ulcerations were found on both labiæ majora, with a sur-

FIG. 1.

Noma affecting both labia majora.

FIG. 2.



Condition present one year later.

rounding areola of hard infiltrated tissue. The labiæ were markedly swollen. Thorough cauterization under chloroform with the Paquelin cautery stopped the progress of the gangrene, and the ulceration healed under the use of zinc ointment.

The temperature was above 101° F. on only two days, and after ten days remained normal. The pulse ranged from 96 to 136, and was weak.

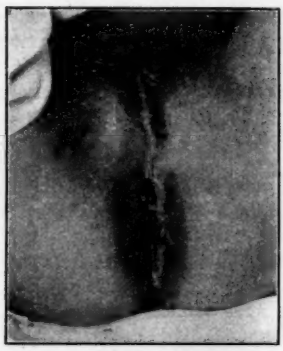
J. B., aged six years, a girl. Family history unknown. (Figs. 3 and 4.) A week after the disappearance of the rash a slight ulceration, with a surrounding hard infiltration, was found on the posterior aspect of the vulva. This ulceration gradually extended toward the rectum. The vulva then became much swollen and had a dark, reddish hue. The inflammation extended on all sides two inches beyond the vulva. After a week, during which time the condition seemed stationary, the inflamed area sloughed off *en masse*. (The photograph was taken just

before the sloughing occurred.) The temperature was normal or subnormal, and the pulse very weak and irregular. After the sloughing the wound healed rapidly. There is now a constant discharge of fecal matter through the vagina.

FIG. 3.

Noma affecting the vulva and rectum.

FIG. 4.



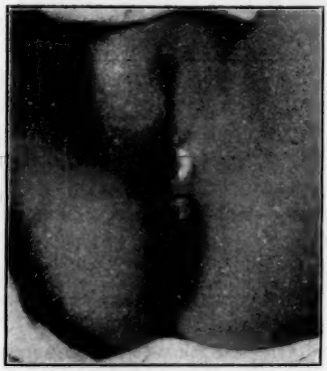
Condition present one year later. Fecal incontinence per vaginam.

K. K., aged seven years, a girl. Family history unknown. (Figs. 5 and 6.) Six days after a mild attack of measles a putrid odor was detected, which, upon examination, was found to come from a gangrenous ulceration of the vulva. The centre of the ulcerated area was

FIG. 5.

Noma affecting the vulva and rectum.

FIG. 6.



Condition present one year later.

black, and the surrounding tissue hard and of a dark, brownish color. The process rapidly extended to the rectum, and there was a complete sloughing of all the intervening and surrounding tissue.

The temperature did not go above 100° F., and the pulse was of good quality and ranged from 84 to 106.

L. B., aged three and one-half years, a boy. Family history unknown. Had an attack of measles, with high fever. He became much prostrated, tonsils were enlarged and ulcerated, and there was marked dyspnœa. Dulness with bronchial breathing was discovered over both lungs. Gangrene of the rectum was detected ten days after the occurrence of the measles. Two days later the mouth and tonsils were found to be gangrenous. After three days the patient died, and the autopsy was made by Dr. Blumer.

The bacteriology of noma has been the subject of a number of researches, each, as a rule, bearing only on one or two cases.

Froriep[1] seems to have been the first to describe parasites in this condition. He figures certain large cells between the muscle fibres, which he considers a form of yeast, but which some later observers interpret as mastzellen.

Schimmelbusch[2] later described in a single case bacilli, at times short, at times appearing in long threads, which were present in the gangrenous tissue in large numbers. They decolorized by Gram. He was able to cultivate them with ease on all kinds of media. Lingard[3] describes similar bacilli in one case.

Grawitz[4] in a single case observed bacilli which grew into long threads at the junction of the necrotic and healthy tissue. They stained by Gram.

Ranke[5] describes cocci in sections from cases which he studied. He made no cultures.

Bartels[6] studied two cases microscopically. In the depths of the necrosed tissue he found in both cases innumerable long, slim bacilli. In one case he notes the thread-like forms. He states that spores were to be made out. The organisms stained by Gram. He made no cultures.

Guizetti,[7] and Babes and Zambilovici,[8] in four cases describe short, thick bacilli with pointed ends, facultative anaërobes, which grew on various media. They stained by Gram's and Weigert's methods in sections, but not in pure culture. Elder[9] also describes bacilli with pointed ends, which might be similar as far as can be judged from his description.

Foote[10] describes long bacilli, at times forming chains, which stained by Gram if decolorization was not carried too far. He was unable to

[1] Chirurgische Kupfertafeln, 1844, p. 458.
[2] Deutsch. medicinische Wochenschrift, 1889, Bd. xv. p. 516.
[3] Lancet, London, 1888, vol. ii.
[4] Deutsch. medicinische Wochenschrift, 1890, p. 318.
[5] Jahrbuch für Kinderheilkunde, 1888, Bd. xxvii.
[6] Ueber Noma. Inaugural Dissertation, Göttingen, 1892.
[7] Policlinico, September-October, 1896.
[8] Annales de Pathologie et Bacteriologie de Bucarest, 1895, vol. v.
[9] Edinburgh Medical Journal, September, 1894.
[10] The American Journal of the Medical Sciences, 1893, vol. cvi.

cultivate the organism, but isolated pus cocci (staphylococcus aureus, streptococcus pyogenes, micrococcus cereus albus).

Nikolaysen[1] found cocci and bacilli in two cases. He was able to cultivate the latter.

Schmidt[2] describes one case in which he was able to cultivate only cocci. In sections he found a mixture of organisms near the surface of the slough, but deep down only slim bacilli. They showed thread-like forms and stained by Weigert, but only faintly by Gram.

Petruschky[3] in one case found diphtheria bacilli, with organisms which he describes as vibrios, and also spirilla. He cultivated only the diphtheria bacilli, and considered them the cause of the process.

Perthes[4] describes in two cases an organism of the streptothrix variety, which he was able to grow anaërobically, but which he did not isolate in pure culture. Krahn doubts that true branching existed in these organisms.

Saft[5] describes cocci and bacilli which he cultivated from one case. The latter he describes as diphtheria-like.

Krahn[6] examined two cases, and found in the deeper parts of the necrotic zone thread-like bacteria, which he compares in appearance with the spirillum sputigenum and the spirochæte dentium. He was unable to cultivate them in ordinary media or in tubes where air was excluded by means of paraffin. From their similarity in appearance to certain mouth organisms he suggests that they are merely mouth organisms exalted in virulence.

To sum up these findings it may be stated that in practically all cases the superficial parts of the slough showed, as would be expected, mixed cultures; in the deeper parts, on the other hand, the sections often showed almost a pure growth. The organisms most frequently found were slim, thread-like bacteria, decolorizing rather easily by Gram and not growing on ordinary media.

In a few cases, as those of Schimmelbusch and Lingard, thread-like organisms easily cultivated were described. In other cases organisms obviously differing entirely from these thread-like forms are described.

Nine of the sixteen cases occurring in the Albany Orphan Asylum were examined. They were selected as cases which showed all the different stages of the process.

The examination included cover-slip examinations in all cases, and cultures on blood serum, agar, and bouillon grown aërobically and also in the Buchner jar.

[1] Cited by Krahn.
[2] Jahrbuch für Kinderheilkunde, 1898, Bd. xlviii.
[3] Deutsch. medicinische Wochenschrift, 1898, No. 15.
[4] Verhandlung d. Deutsch. Gesellsch. für Chirurgie, XXVIII. Kongress.
[5] Ueber Noma. Inaugural Dissertation, Halle, 1898.
[6] Mittheilungen aus den Grenzgebieten der Medicin und Chirurgie, 1900, Heft 4 und 5.

The result of the bacteriological examination of the nine cases can be briefly summarized as follows:

In all cases one organism and one alone was constantly present in large numbers in cover-slips. This was an organism which in smears took the form of a leptothrix. It averaged one-half micron in breadth, and varied from five to twenty microns or even more in length. The short forms were usually bent, the long forms curled or wavy. The organism stained rather poorly with gentian violet, much better with carbol-fuchsin. It did not decolorize by Gram, though it stained faintly by his method. It showed no branching. In smears from the early cases this was almost the only organism present. As the process grew older the cover-slips showed a greater mixture of organisms. Those from the later stages showed beside the thread-like organism, short, thick bacilli decolorizing by Gram, and also cocci either in groups or chains which did not decolorize by Gram. All of the cultures failed to show the thread-like organism. The colon bacillus was present in all cases, as were some of the pus cocci, the streptococcus pyogenes occasionally, much more commonly the staphylococcus aureus.

Of the cases which died we were able to procure an autopsy on but one, a boy, in which the gangrenous process surrounded the anus. The cause of death was a capillary bronchitis with extensive bronchopneumonia due to the streptococcus pyogenes. In this case cover-slips taken from the deep portion of the necrosed area showed only the long, thread-like organisms and cultures, both aërobic and in Buchner's jars, were absolutely sterile. The following is the description of the microscopic lesions:

The lesion occupies the skin around the anus and the subjacent fat and connective tissue. The sections show that the entire skin and the subjacent tissue for some depth beneath it are completely necrotic. Every tissue in the necrotic area is totally devoid of nuclei, and no nuclear fragments are to be made out. In sections stained with hæmatoxylin and eosin bluish masses of bacteria can be seen. Between this necrotic area and the healthy tissue is a narrow zone showing inflammatory reaction. The fat and connective tissue in this zone are infiltrated with polynuclear leucocytes. These are only moderate in number. There is absolutely no sign of regenerative changes in the affected tissues. Sections stained by Gram's method show in the superficial portions of the necrotic zone a variety of bacteria; many are cocci in pairs and chains, and there are many long thread-like forms faintly stained. Sections stained with eosin and methylene blue show that many short bacilli are also present. The deeper parts of the necrotic area show a single organism which is also present in the zone of reaction, and to a slight extent in the healthy tissue. It is seen best in sections stained in carbol-fuchsin and decolorized by oil of cloves, according to Flexner's method.

It presents exactly the same appearance as the organism which was constantly present in cover-slips from all the cases. In the deeper part of the necrotic zone the organism is present in enormous numbers. The individual bacteria are nearly always seen as very long threads, which for the most part lie parallel to and between the fibrillæ of the connective tissue. The organisms follow with remarkable fidelity the wavy arrangement of the connective tissue fibrils in many instances. This is not always the case, for a good many shorter forms are seen which run crosswise to the connective tissue fibrils. The number of organisms in the reactionary zone is much less than that in the necrotic zone, and there is a gradual diminution in number as the healthy tissue is approached, though a small number of the organisms are found in apparently unaltered tissue.

As a result of this investigation and of an analysis of the literature, it must be concluded that noma, while originating in all probability as a simple infection, is always in its later stages a mixed infection, and that, while it is probably not always due to the same organism, it is most frequently due to a long thread-like organism of the leptothrix type, which does not grow upon ordinary culture media. Krahn's assumption that it is due to mouth organisms is negatived by finding similar organisms in noma of the genitalia.

SOME NEW POINTS IN REGARD TO RAYNAUD'S DISEASE.

By Carl Beck, M.D.,
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That the tissue changes in Raynaud's disease are not confined to the soft tissues, but also affect the bones, can be well demonstrated by the Röntgen rays. The following cases may serve as an illustration:

Case I.—A woman, aged forty-two years, who had been well until fourteen years ago, noticed a slight pain in the index finger of her left hand. At the same time there was a marked pallor of the whole finger. Four months after the sudden onset of the pain repeated congestion was observed in the region of the second and third phalanx of the same finger, which continued until about six months after the onset of the first symptoms. The tip of the finger became dry and black. Amputation was then performed. The patient regained and kept her health until six months ago, when the same pain and pallor extended symmetrically over both hands.

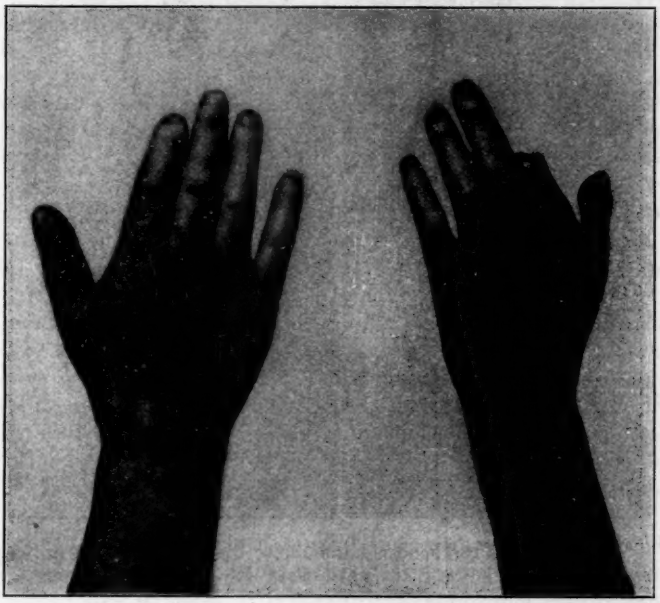
When I saw the patient for the first time I noticed great pallor of the third, fourth, and fifth left fingers, and of the little right finger.

The second, third, and fourth right fingers were moderately anæmic. (Fig. 1.) Sometimes the color changed into a cyanosed appearance.

Both hands were very cold, just as in true gangrene. No other parts of the body were affected. There was no fever. The examination of the urine was negative. The patient did not seem to be hysterical, but sometimes apparently suffered intense pain.

The skiagraph (Fig. 2) showed atrophy of the upper ends of the third phalanges (second phalanx of the thumbs) and osseous proliferation at the upper end of all second phalanges (first of the thumbs). There was also thickening of the epiphyseal ends of the second, third, and

FIG. 1.

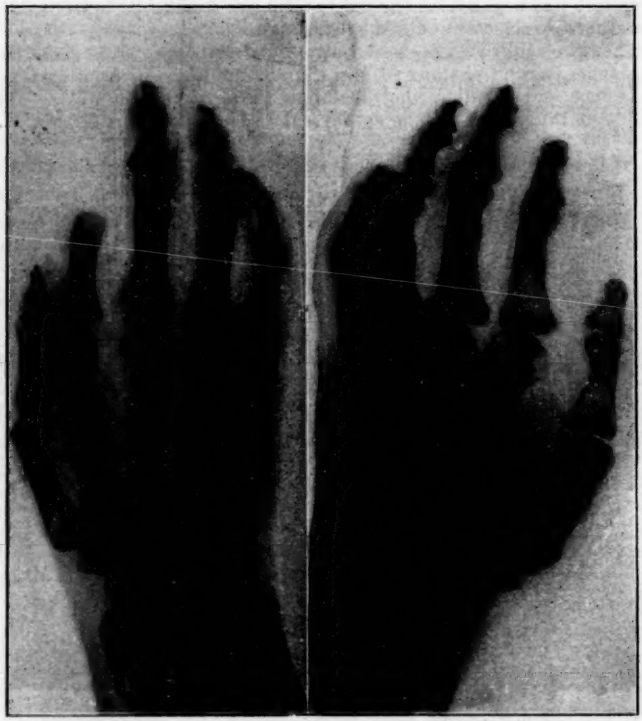


fourth metacarpal bones. The third phalanges appeared, in fact, triangular, and resembled claws.

CASE II.—A similar condition was found in a feeble man, aged thirty years, who at the present time has fully recovered. The onset took place on the toes of his right foot, gangrene of the whole foot becoming complete two months afterward, so that Syme's operation was performed. Skiagrams taken of the living foot before and after the operation showed nothing abnormal. But one year later the disease commenced in both hands to a moderate degree. The fingers were covered with cold sweat, and red and blue patches at times. The tip of the left index finger, together with the upper end of the third phalanx, became gangrenous. The skiagraph of the hand showed the

same appearance as the case described above. The patient was treated with arsenic and local gentle massage.

FIG. 2.



The nutrition of the bone is much more disturbed by this unrecognized vasomotoric lesion than is assumed. It would be well worth while to study these phenomena more extensively.

OBSERVATIONS ON THE FREQUENCY AND DIAGNOSIS OF THE FLINT MURMUR IN AORTIC INSUFFICIENCY.[1]

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IN 1862 Austin Flint, in an article on cardiac murmurs,[2] called attention to the occasional existence, in uncomplicated aortic insufficiency,

[1] Read before the Association of American Physicians, 1901.
[2] THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES, 1862, IV. S., XLIV., 29.

of a presystolic murmur limited to the region of the cardiac apex, and distinct from the characteristic murmur of aortic regurgitation. This sound occurred in the latter part of diastole, was loud and blubbering, and had all the characteristics of a mitral, direct, presystolic murmur. Flint recognized it as such, and offered the following explanation: "The explanation involves a point connected with the physiological action of the auricular valves. Experiments show that when the ventricles are filled with a liquid, the valvular curtains are floated away from the ventricular sides, approximating to each other and tending to closure of the auricular orifice. In fact, as shown by Drs. Baumgarten and Hamerik, of Germany, a forcible injection of liquid into the left ventricle through the auricular opening will cause a complete closure of this opening by the coaptation of the mitral curtains, so that these authors contend that the natural closure of the auricular orifices is effected not by the contraction of the ventricles, but by the forcible current of blood propelled into the ventricles by the auricles. However this may be, that the mitral curtains are floated out and brought into apposition with each other by simply distending the ventricular cavity with liquid, is a fact sufficiently established and easily verified. Now, in cases of considerable aortic insufficiency the left ventricle is rapidly filled with blood flowing back from the aorta, as well as from the auricle before the auricular contraction takes place. The distention of the ventricle is such that the mitral curtains are brought into coaptation, and when the auricular contraction takes place the mitral direct current passing between the curtains throws them into vibration and gives rise to the characteristic blubbering murmur. The physical condition is, in effect, analogous to contraction of the mitral orifice from an adhesion of the curtains at their sides, the latter condition, as clinical observation abundantly proves, giving rise to a mitral direct murmur of similar character."

In 1883 Dr. Keyt,[1] while disputing Flint's explanation of the origin of the murmur, suggesting that it might arise at the aorta in systole, proposed that it be called the murmur of Flint, a term which has since been used by many. In 1883 Flint[2] recorded another observation of the same nature, and in 1886 discussed the subject at length in an article in THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES, 1886, xci., 35, and since that time the phenomenon has been recognized by numerous clinicians.

Most observers who have recognized the Flint murmur have agreed on considering its occurrence unusual. Guitéras, however, sixteen years ago,[3] expressed the belief "that obstructive functional mitral

[1] Boston Medical and Surgical Journal, 1883, cix., 30.
[2] Lancet, London, 1883, i., 131.
[3] Medical News, Philadelphia, 1885, xlvii., 533.

murmurs are of frequent occurrence in aortic regurgitation." He suggested that the obstruction offered by the partially closed mitral valves at the time of the entrance of the auricular blood might serve in the manner of a safety-valve and help to prevent overdistention of the ventricle. Guitéras[1] reported three characteristic cases and advanced a modification of Flint's theory as to the manner of origin of this murmur, asserting that in aortic regurgitation the mitral leaflets are not "floated upward," but are actively driven against the auricular blood by the force of the general arterial tension; that such force is, in all probability, often exerted against the anterior leaflet of the mitral valve by a regurgitant current which falls directly upon it.

Osler[2] also asserts that this murmur occurs in a considerable proportion of all cases.

In Gibson's recent work,[3] after a thorough discussion of Flint's description of this murmur and a review of the literature on the subject, there appear the following words: "Being thoroughly conversant with Flint's views since the appearance of his second paper, the points under discussion have been diligently sought for by us; so far, however, without result. Cases have frequently presented themselves, no doubt, in which, with absolute evidence of aortic disease, there has been a presystolic murmur, but in every one of these, without exception, post-mortem examination has revealed mitral obstruction as well as aortic lesions."

My attention was first called to the subject fourteen years ago by Guitéras' article, and two years later, while house physician at the Massachusetts General Hospital, I had the good fortune to observe a case in which my diagnosis of the Flint murmur was confirmed by necropsy. Since that time I have been impressed with the fact that the Flint murmur is a far commoner manifestation than might be inferred from the usual statements in literature. It has, therefore, seemed to me that it might be of considerable interest to analyze the clinical and pathological records of those cases of aortic insufficiency which have come to necropsy in Professor Osler's clinic at the Johns Hopkins Hospital.

A majority of these cases have been under my personal observation.

The purpose of this investigation is to reach some conclusion as to the frequency of this phenomenon and the grounds upon which a diagnosis may be made *intra vitam*.

Inquiry into the exact physical cause of the murmur will be beyond the limits of this communication.

[1] Transactions of the Association of American Physicians, 1887, ii., 39; also, Boston Medical and Surgical Journal, 1887, cxvii.

[2] Practice of Medicine, New York, 1898, 8vo, 3d ed, p. 714.

[3] Diseases of the Heart and Aorta, Edinburgh, 1898, 8vo., p. 497.

Since May, 1889, 74 cases of aortic insufficiency have come to necropsy at the Johns Hopkins Hospital. In 45, or 60.8 per cent., of these cases there was heard, at some time during the observation of the patient, a rumbling, echoing murmur in diastole, limited to the region of the apex, and differing from the diastolic murmur of aortic insufficiency; in other words, a murmur exactly similar to that characteristic of stenosis of the mitral valve. This murmur, in the great majority of instances, was truly presystolic in time, ending sharply in the first sound, or in a systolic murmur. In some cases it was separated by a short interval from the first sound, occurring in the middle of diastole.

In 12, or 26.6 per cent. of these cases, there existed a stenosis of the mitral valve as well as aortic insufficiency.

In 33, or 73.3 per cent., the mitral orifice was of normal or increased circumference.

In all of the 12 cases in which there was an actual mitral stenosis the anatomical lesion was an endocarditis. In one instance there was also general arterio-sclerosis.

Of the remaining 33 cases without mitral stenosis, the endocardial changes were part of a general arterio-sclerotic process in 16; in 17 there was chronic or acute endocarditis. In 4 of these latter instances there was a general arterio-sclerosis as well.

Of the 33 cases of aortic insufficiency in which, without mitral stenosis, a rumbling, vibratory presystolic murmur limited to the region of the apex was observed, the condition of the mitral valve, beyond the dilatation of the orifice which is the rule in well-marked aortic insufficiency, was absolutely normal in 17 instances; in 16 greater or less change was present.

Of these 16 cases, in 4 instances the changes consisted simply in a slight thickening of the free edges of the curtains; in 8 the changes were those of chronic endocarditis without stenosis; in 3 there was subacute vegetative endocarditis, quite insufficient to have caused the presystolic murmur; in 1 there were rather large fresh vegetations upon the valve, which might have been sufficient to cause a murmur in diastole.

Of these 16 cases in which there were changes in the mitral valve other than stenotic, the lesions were part of a general arterio-sclerotic process in 4, or 25 per cent.; in 12, or 75 per cent., the changes were those of chronic or acute endocarditis. In one of these cases there was also a general arterio-sclerosis.

Of the 17 instances in which the mitral orifice was normal, in 12, or 70.5 per cent., the changes in the aortic valve were secondary to a general arterio-sclerosis and atheroma of the aorta; in 5 there was chronic valvular endocarditis. In 3 of these latter cases there was also a general arterio-sclerosis.

In 29, or 39.1 per cent., of the 74 cases of aortic insufficiency no

presystolic murmur was heard. In four of these cases there was mitral stenosis. Of the remaining 25 cases, in 10, or 40 per cent., the mitral valves were essentially normal; in the other 15, or 60 per cent., more or less marked chronic or acute alterations in the valves or chordæ tendinæ were present.

In 16, or 64 per cent., of these 15 cases the process was apparently secondary to a general arterio-sclerosis; in 8, or 32 per cent., the condition was the result of chronic or acute endocarditis; in 1 the lesion of the aortic valves was apparently congenital.

On considering these figures one or two interesting facts become evident.

With Regard to the Frequency of Mitral Presystolic Murmur in Aortic Insufficiency Uncomplicated with Mitral Stenosis.

Out of 58 cases such a murmur was heard in 33, or 56.8 per cent.

One might insist that this percentage is too large in that I have included among these 33 instances 16 in which chronic or acute changes other than stenotic were present in the mitral valve. Might not these changes, after all, have played a certain part in the production of the presystolic murmur? While it may be, as held by Phear,[1] that marked shortening of the chordæ tendinæ alone may sometimes result in a presystolic murmur, yet this event is assuredly rare. And the following figures suggest that changes in the mitral valve other than stenotic have little effect on the production of a presystolic murmur.

Out of 27 cases of aortic insufficiency in which the mitral valve was anatomically absolutely normal, a presystolic murmur was heard in 17, or 62.8 per cent.

Out of 31 instances of aortic insufficiency in which the mitral valve showed greater or less change other than stenosis, a presystolic murmur was heard in 16 instances, or 51.6 per cent.

It would then appear to be clear that disease of the mitral valve other than stenosis plays no essential part in the production of a presystolic murmur.

The majority of our cases, then, of aortic insufficiency have showed, on careful examination, a Flint murmur—that is, a presystolic or late diastolic, rumbling or echoing murmur, heard in the region of the apex —a murmur clearly independent of organic mitral stenosis.

Is it Possible to Distinguish Intra Vitam Cases of Aortic Insufficiency with Flint Murmur from those Complicated with Mitral Stenosis?

It may be well to consider, first, the relative frequency of some of the more characteristic physical signs of mitral stenosis. The following are, perhaps, among the more important:

[1] Lancet, 1895, vol. ii. p. 716

1. *The character of the pulse*, which, as a rule, is small, and, in condition of good compensation, of tolerably good tension, often irregular.

2. *The character of the cardiac impulse.* The sharp, tapping, systolic shock is, perhaps, one of the most constant and characteristic signs of mitral stenosis.

3. *The thrill*, presystolic or sometimes mid-diastolic in time, and limited closely to the apex region.

4. *The evidences of right-sided hypertrophy* and the *accentuated second pulmonary sound*, which, however, are not especially important in the present consideration.

5. *The presystolic murmur.* There are few more characteristic signs than the rumbling, rasping or softer, echoing, vibratory, crescendo, presystolic murmur, ending, as it usually does, sharply in a snapping first sound. Sometimes, when the heart's action is slow, there may be a momentary separation between the end of the rumbling murmur and the occurrence of the first sound.

6. *The snapping first sound.* The modification of the first sound is also a very characteristic element in mitral stenosis—the first sound which has the short, snapping, valvular character of a second sound. An element of this snapping sound is often present, even when a well-marked systolic murmur occurs.

In many instances when thrill and presystolic murmur are entirely absent a snapping valvular first sound, in connection with a small pulse, a dilated right heart, and an accentuated second, pulmonic sound, may be sufficient to justify a diagnosis of mitral stenosis.

An analysis of the physical signs in 22 cases of uncomplicated mitral stenosis which have come to necropsy at the Johns Hopkins Hospital reveals the following facts:

1. *Pulse.* In all but three of these cases (86.3 per cent.) the pulse was of small size. In 3 instances where the stenosis was of very slight extent the pulse was described as of fairly good size.

2. *Thrill.* A thrill was present in 12, or 54.5 per cent., of the cases.

3. *Systolic shock.* A tapping systolic shock was present in 15, or 68.1 per cent., of the cases.

4. *Snapping first sound.* A characteristic snapping, valvular first sound was audible in 15, or 68.1 per cent.

5. *Presystolic murmur.* A presystolic murmur, the most characteristic of the cardiac signs, was present in 17, or 77.2 per cent., of the cases.

The most important signs, then, of mitral stenosis in order of frequency, are the presystolic murmur, the tapping shock of the first sound, the short, valvular, snapping first sound, the presystolic thrill, in association with the small pulse, the accentuated second pulmonic sound, and the enlargement of the right side of the heart.

Are these signs modified in cases of mitral stenosis combined with aortic regurgitation?

Let us examine our records with regard to the character of the signs in cases of this nature.

Sixteen such cases came to necropsy.

In 3 of these 16 cases there were no symptoms whatever of mitral stenosis. One of these was a case of marked aortic stenosis with insufficiency and slight narrowing of the mitral orifice; in another case, seen only *in extremis*, but a slight presystolic thrill at the apex was noted.

1. *Pulse.* In 1 of these 16 instances, that combined with aortic stenosis, there was naturally a small pulse; in 4 the pulse was large and collapsing, but in 1 the statement is made that it was not of a typical Corrigan quality; in 3 it was noted that the pulse was of moderate size and collapsing; in 1 a collapsing character alone was mentioned; in 3 it was noted that the pulse was small, but collapsing; in 3 the pulse was small, but no especial mention of its aortic character was noted; in one it was especially noted that the pulse was not of aortic quality.

2. *Thrill.* Of these 16 cases, a presystolic thrill was present in 8, or 50 per cent.

3. *Systolic shock.* A tapping systolic shock was noted in 7, or 43.7 per cent.

4. *Snapping first sound.* A snapping first sound was heard in 12, or 75 per cent.

5. *Presystolic murmur.* A presystolic murmur was present in 12, or 75 per cent.

The most constant and characteristic symptoms here, as in uncomplicated mitral stenosis, are the presystolic murmur and the snapping character of the first sound.

In 10 of these cases, where the aortic lesion was the more important, the degree of hypertrophy of the left ventricle was marked. In five, however, where the mitral stenosis was of considerable extent, there was but a moderate enlargement of the left side in association with a rather small pulse. In 1, where the aortic lesion was apparently primary, there was marked hypertrophy, with a small collapsing pulse.

The following table may serve to emphasize the modifications of the more essential signs of mitral stenosis observed in cases complicated with aortic insufficiency:

TABLE I.

	Uncomplicated mitral stenosis.	Mitral stenosis and aortic insufficiency.
Small pulse	86.3 per cent.	37.5 per cent.
Thrill	54.5 "	50 "
Tapping systolic shock	68.1 "	43.7 "
Snapping first sound	68.1 "	75 "
Presystolic murmur	77.2 "	75 "

A consideration of these figures would appear to show that the ordinary signs of mitral stenosis, apart from the greater left-sided hypertrophy, are not essentially changed when this condition is complicated with aortic insufficiency, with the exception of the fact that the pulse in the latter condition is often of a larger size and collapsing and—a modification of some interest—that the tapping character of the systolic shock is considerably less frequent.

Let us now compare with these figures the results of our analysis of the symptoms in 33 cases of aortic insufficiency with Flint murmur.

1. *The pulse.* Of 33 cases of aortic insufficiency uncomplicated with mitral stenosis in which Flint murmur was heard, 1 was associated with aneurism of the aorta, 1 with a slight aortic stenosis, while in another the patient was moribund and the pulse was impalpable at the wrist. In 1 no satisfactory note could be found, and in another instance the only note was made toward the fatal termination of the case during a pericarditis.

Of the remaining 28 cases a typical Corrigan pulse was noted in 14, or 50 per cent. In 4 the pulse was of typically aortic character, with the exception of the fact that the size was hardly as large as is commonly noted. In 4 the pulse was collapsing, but no note was made of the size. In 1 the statement was made that the pulse was slightly collapsing in character. In 3 the pulse was said to be of a somewhat aortic character. In 2 it was simply noted that the pulse was compressible. In 1 the statement is made that the pulse was of fair volume and good tension.

In none of these instances, then, was the pulse described as small.

2. *Thrill.* Of 33 cases of aortic insufficiency with Flint murmur, a palpable thrill was observed in 14, or 42.4 per cent.

3. *Tapping systolic shock.* A characteristic tapping systolic shock was noted in but 5, or 15.1 per cent., of the cases, and in 2 of these instances the tapping character was slight or inconstant.

4. *Snapping first sound.* Of 33 cases of aortic insufficiency with Flint murmur the first sound was of a snapping valvular character in but 10, or 30.3 per cent. In 2 of these instances the snapping character was very slight, and in a third inconstant, having been noted only during attacks of tachycardia.

A better estimate of the differences in the physical signs from those in aortic insufficiency complicated with true stenosis may be made from a study of the following table, in which the symptoms in cases with Flint murmur are placed side by side with those in uncomplicated mitral stenosis and combined mitral stenosis and aortic insufficiency. For the sake of a fairer comparison only those cases of true mitral stenosis and mitral stenosis complicated with aortic insufficiency have been tabulated in which a presystolic murmur was present.

TABLE II.

	Uncomplicated mitral stenosis. (17 cases.)	Mitral stenosis and aortic insufficiency. (14 cases.)	Aortic insufficiency with Flint murmur. (33 cases.)
Small pulse	82.3 per cent.	28.5 per cent.	.0 per cent.*
Presystolic thrill	64.7 "	50 "	42.4 "
Tapping systolic shock	76.4 "	50 "	15.1 "
Snapping first sound	64.7 "	78.5 "	30.3 "

* Based on 28 cases. See above.

These tables bring out certain fairly well-marked clinical differences between the cases of aortic insufficiency with Flint murmur and those complicated with true mitral stenosis. The character of the presystolic murmur is essentially the same in both conditions with one exception: a Flint murmur is never as rasping and intense as are the more marked murmurs of true mitral stenosis; it is commonly echoing and of moderate intensity. It is fair, however, to remember that in a very large proportion of cases of true mitral stenosis the murmur is also of this character. Out of the 22 fatal cases of mitral stenosis above referred to, the murmur was absent or was described as an echo or as a faint rumbling murmur in 12, or 54.5 per cent., of the cases.

The presystolic thrill is also less frequent and less intense, but perhaps the most striking difference between the two conditions is in the character of the systolic shock. In but a very small proportion of the cases of aortic insufficiency with Flint murmur does the apex impulse have the tapping character so significant of a true mitral stenosis; this appears, however, to be present in about half the cases of aortic insufficiency combined with true mitral stenosis. In the majority of instances of Flint murmur the systolic impulse has the usual characteristics of that observed in aortic insufficiency, namely, a forcible but rather heaving lift. The snapping valvular first sound is also rare. In the instances with Flint murmur the first sound, if it be not replaced by a systolic murmur, is commonly dull, humming, prolonged, indeed, as is often the case in aortic insufficiency, almost more a lift than a sound.

But, apart from the physical signs related to the heart itself, there are other points which may be of considerable help in diagnosis. Most important among these is the pulse. The pulse in aortic insufficiency complicated with true mitral stenosis was recorded as small in over a quarter of the cases. In uncomplicated aortic insufficiency with Flint murmur the pulse is always characteristically large and collapsing.

The condition of the peripheral arteries and various points in the history of the case may also be of assistance in diagnosis.

Thus, out of 16 cases of aortic insufficiency complicated with mitral stenosis in all but 3, or 81.2 per cent., there was a distinct history of rheumatism or chorea, or symptoms justifying a diagnosis of acute endocarditis. In 3 cases the process was clinically arterio-sclerotic.

Out of 33 cases of aortic insufficiency with Flint murmur there was a clinical history of acute rheumatism, or chorea, or signs justifying a diagnosis of endocarditis *intra vitam* in but 13 instances, or 39.3 per cent., while in 18, or 54.5 per cent., there was clinical evidence of a general arterio-sclerosis.

Anatomically the changes in the valves were part of a general arterio-sclerosis or an atheroma of the aorta in 20, or 60.6 per cent., of the cases. In 13, or 39.3 per cent., of the cases the condition was an acute or chronic endocarditis. In 4 of these cases there existed also arterio-sclerosis.

In 25 cases of uncomplicated aortic insufficiency without Flint murmur the percentages were essentially the same. In 16, or 64 per cent., the process was a part of a general arterio-sclerosis; in 8, or 32 per cent., the condition was due to endocarditis; in 1 the defect in the valve was congenital.

As might be expected, there are certain slight differences in the average age of the cases with Flint murmur and those of aortic insufficiency complicated with mitral stenosis—differences depending clearly upon the fact that in the one condition the changes are more commonly due to arterio-sclerosis, which is generally a senile change, and in the other to endocarditis, which so frequently occurs in early life. This is well shown by the following table:

TABLE III.

Age.	Aortic insufficiency with Flint murmur.	Aortic insufficiency complicated with mitral stenosis.
1–10	1	0
10–20	5	3
20–30	4	3
30–40	9	5
40–50	7	2
50–60	5	2
60–70	1	0
70–80	1	1
Totals	33	16

Thus, it will be seen that 57.5 per cent. of the cases of Flint murmur occurred in individuals under forty years of age, against 68.7 per cent. among the cases of true mitral stenosis. But these differences are too slight to be of any diagnostic importance.

That there is nothing essential in the arterio-sclerotic process which predisposes to the development of a Flint murmur is shown by the fact that out of 32 cases of uncomplicated aortic insufficiency where the lesion was purely arterio-sclerotic in origin, a Flint murmur was heard in 50 per cent., while in 21 instances where the lesions were due to an acute or chronic endocarditis the percentage of Flint murmurs was actually greater, namely, 60.9 per cent.

The diagnostic importance of demonstrable arterio-sclerosis lies in the fact that while arterio-sclerotic cardiac lesions are usually confined to the aortic orifice, in endocarditis, on the other hand, the possibility of simultaneous affection of the mitral valves, and hence the probability of a true stenosis, is appreciably greater.

Broadbent[1] believes the Flint murmur to be more frequent in cases where the insufficiency is combined with stenosis of the aortic valves.

In three of our cases there was aortic stenosis as well as insufficiency, but in only one was a Flint murmur heard. In the other two instances, despite the existence of true mitral stenosis in one, there was no presystolic murmur.

To sum up the results of these comparative observations it may be said that a positive diagnosis of a functional mitral presystolic murmur may be difficult to make. The character of the murmur differs in no way from that of true mitral stenosis. In true mitral stenosis, however, even if complicated with aortic insufficiency, the tapping systolic shock and the snapping first sound are common. The Flint murmur, on the other hand, is usually associated with the characteristic, heaving impulse of aortic insufficiency and the dull, ill-defined, prolonged first sound. A tapping impulse and a snapping first sound may, however, be present.

Of special importance is the character of the pulse. In cases of aortic insufficiency with Flint murmur the pulse is large and collapsing; in instances combined with true mitral stenosis there is generally an appreciable modification of the size of the pulse.

The diagnosis of Flint murmur is fairly safe when a rumbling or echoing presystolic murmur in the region of the apex is present in aortic insufficiency occurring in an individual with well-marked general arterio-sclerosis, especially where there is no history of any acute malady ordinarily associated with the development of endocarditis, and in the absence of a marked systolic shock or snapping first sound. If, on the other hand, the patient be an individual with soft peripheral arteries and a history of attacks of acute rheumatism or chorea, or other evidence suggestive of the existence of an endocarditis, the probability of concomitant affection of the mitral valve is greater, and the possibility of arriving at a definite diagnosis is correspondingly less.

While, as a rule, the Flint murmur is not of very great intensity, is associated with little or no thrill, with no marked tapping systolic shock, and rarely with a snapping first sound, there may be striking exceptions to this rule. The following case may serve to show how careful one should be in assuming the existence of a true mitral stenosis from the presence of nearly all the classical signs, if aortic insufficiency be present.

[1] Heart Disease, London, 1900, 8vo., 3d ed., p. 150.

D. B., a colored laborer, aged between forty-five and fifty-five years, was admitted to the Johns Hopkins Hospital on July 22, 1896, complaining of shortness of breath and swelling of the legs. His family history was negative, as was his personal history, except for what was, apparently, an attack of sciatica which lasted for about four months.

For several months before entry he had been suffering with shortness of breath, which had steadily increased. For four weeks there had been swelling of the abdomen. Two months before entry he had to give up work on account of shortness of breath.

Physical Examination. The patient was a fairly well-nourished colored man with well-marked arcus senilis. The radial arteries were moderately thickened. There was œdema of the legs, and ascites. Examination of the lungs showed fine moist râles at both bases.

Heart. The cardiac impulse was in the fifth interspace about in the mammillary line. There was no marked systolic shock, but a slight presystolic thrill was to be felt. On auscultation at the apex there was heard a slight presystolic murmur ending in a snapping first sound, followed by a soft systolic murmur; the second sound was not audible at the apex. Passing upward toward the base a well-marked diastolic murmur of aortic character became audible; it was of maximum intensity at the left third and fourth cartilages. The pulse was collapsing.

Under rest, diuretics, and iodide of potassium the patient improved greatly, and left the hospital on August 31st.

From this time up to the date of his death the patient was admitted to the hospital five times.

On September 21, 1896, the following note was made by Professor Osler: "At the apex-beat a loud systolic shock is preceded by a somewhat rough murmur in diastole, which does not run quite up to the beat."

And, again, on September 25, 1896: "At the sixth interspace a rough presystolic murmur is well heard, and the shock of the first well felt; no thrill. The systolic shock is marked."

On October 2d: "The shock of the first sound is well marked on palpation."

On April 2, 1897, the following note was made by Dr. Thayer: "The pulse is collapsing and rather large, but not as large as often seen in aortic insufficiency. At the point of maximum impulse there is no distinct thrill. The first sound is rather sharp and followed by a slight systolic murmur which is lost in the mid-axilla. As one passes outside the point of maximum impulse the snapping character of the first sound is rather suggestive. The second sound at the point of maximum impulse is followed by a slight, soft, diastolic murmur. Almost immediately after the second sound there begins another murmur, which at first is extremely difficult to separate from the aortic diastolic, but which is of a different pitch. This is heard best in the fifth space just in the mammillary line, where it has an echoing quality and increases in intensity, ending in the first sound. It is not heard above the fifth rib or inside the parasternal line, and is lost a short distance outside the point of maximum impulse. Above and inside of this area a soft systolic and diastolic murmur are to be heard. The diastolic murmur is audible in the aortic area, but is loudest along the left border of the sternum at about the fourth space; it has a soft,

aortic character. In the aortic area it does not entirely replace the second sound. The second pulmonic is not particularly loud; systolic and diastolic tones in the carotids."

April 9, 1897. Dr. Osler: "Systolic shock is well felt at the apex and base. . . . The presystolic murmur has all the characters of a true stenotic murmur."

The patient died on October 30, 1898. Repeated notes were made by Professor Osler, by Drs. M'Crae and Futcher, and by myself. The valvular snapping character of the first sound was constantly referred to. The thrill was of moderate intensity and was often absent. The presystolic murmur also varied greatly in intensity.

Owing to the nature of the systolic shock and the snapping character of the first sound, a diagnosis of true mitral stenosis in association with aortic insufficiency was universally concurred in.

The necropsy, however, showed general arterio-sclerosis with moderate thickening and retraction of the aortic valves. The mitral curtains were absolutely normal.

A word before closing as to the cause of this interesting phenomenon. As I stated in the beginning, Flint[1] assumed that the back flow of blood from the aorta resulted in a floating upward of the valvular curtains so that they were brought approximately into apposition, thus causing a practical stenosis of the mitral valve at the time of contraction of the auricle.

Keyt's[2] view that the murmur arises at the aortic orifice in systole is scarcely worth considering.

Guitéras,[3] as has been said, adopted a modification of Flint's view. "He forgets, it seems to me," he says, "that in aortic regurgitation the leaflets are not floated upward, but are actively driven against the auricular blood by the force of the general arterial tension. . . . I maintain that these propagated murmurs are, in fact, mitral obstructive murmurs, and that they are more apt to develop when the posterior aortic segment is affected, because in such cases the recurrent stream is brought to bear directly against the anterior leaflet of the mitral valve."

Sansom[4] asserts that the development of a presystolic murmur would be impossible if, as Flint suggested, the mitral curtains were actually brought into coaptation. "I cannot imagine that, the mitral curtains being brought into coaptation, and the orifice being itself closed, any force proceeding from the auricle could separate them or cause the blubbering sound. It would be quite otherwise, however, if they were brought together without completely closing the auriculo-ventricular aperture. In such a case two explanations will be possible: (*a*) The lifting force of the current impinging upon the under surface of the great anterior mitral curtains might so obstruct the current from the

[1] Op. cit. [2] Op. cit. [3] Op. cit.

[4] The Diagnosis of Diseases of the Heart and Thoracic Aorta, London, 1892, p. 385.

auricle as to create a *de facto* impediment at the end of each diastole; or (*b*) the vibrations might be directly communicated by the regurgitant stream from the aorta to the great mitral curtain. The nearness of the posterior segment of the aortic valve—diseased, perhaps, so that the morbidly-produced orifice in diastole presents ragged or fringed borders—to this mitral flap may well account for such vibrations. These vibrations may attain only to an intensity and rapidity sufficient to cause murmur somewhat late in the diastolic period. The force of the auricular systole would necessarily amplify and intensify such vibrations of the free edge of the flap until the commencement of ventricular systole or the tug of the chordæ tendinæ abruptly stopped them, bringing both curtains of the valve together and completely closing the auriculo-ventricular orifice. It occurs to me that this is a more probable explanation than that which postulates the production of a virtual stenosis of the orifice by the fluid pressure of the aortic regurgitant stream."

Potain[1] is inclined to accept the idea that "the retrograde blood current from the aortic orifice, which is insufficient, presses back the great curtain of the mitral, whence a relative narrowing of the mitral orifice. This great curtain is then between two parallel currents of varying rapidity, the retrograde current of aortic insufficiency and that produced by the blood coming from the auricle. Under the influence of these two currents the mitral valve enters into vibration which results in the production of a thrill appreciable by the hand and of the presystolic murmur or rumble perceptible to the ear."

Essentially the same view is held by Broadbent.[2]

This explanation of the origin of the murmur is similar to that of Guitéras, and would seem, upon the whole, reasonable.

In conclusion, one may be justified in saying that in uncomplicated aortic insufficiency a rumbling, echoing, presystolic, or mid-diastolic murmur limited to the region of the apex of the heart is very common, occurring, when carefully looked for, in fully half of the cases. The characters of this murmur are in no way different from that commonly observed in true mitral stenosis, with the exception of the fact that it is usually of moderate intensity. It is, however, rarely associated with a tapping systolic impulse and a snapping first sound, which are the rule in true mitral obstruction, while the pulse is large and characteristic of uncomplicated aortic insufficiency. In the absence of these signs, and with a large pulse the functional character of an apex presystolic murmur in aortic insufficiency is to be suspected, especially in cases where there is no history of acute infectious processes such as are

[1] Gaz. d. Hôp., Paris, 1893, lxvi., 295. [2] Op. cit.

ordinarily associated with endocarditis, and where there is evidence of well-marked arterio-sclerosis.

A Flint murmur may, however, be associated with many of the clinical features of a true organic mitral obstruction.

OSTEITIS DEFORMANS.[1]

By Frederick A. Packard, M.D., J. Dutton Steele, M.D.,
and
Thomas S. Kirkbride, Jr., M.D.,
of Philadelphia.

Before proceeding with the report of this case we would state that the histological examination of the tissues was begun by the late Dr. T. S. Kirkbride, Jr., whose untimely death from typhoid fever, contracted in laboratory work, came soon after the beginning of what promised to be a brilliant career. The work so begun by Dr. Kirkbride was taken up and carried to completion by Dr. Steele.

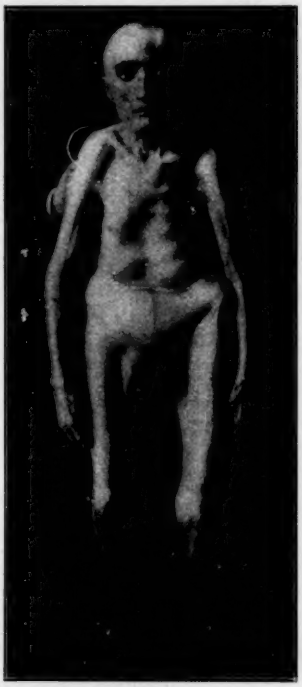
In April, 1899, there was admitted to the men's ward of the Philadelphia Hospital a German, aged sixty-two years, who for some months had been an inmate of the almshouse department. Until the onset of an acute indisposition, for which he was referred to the wards, he had attracted no particular attention. Owing to the fact that he could speak almost no English and was very deaf, with some impairment of mental power, nothing could be learned of his past history. Attention was attracted to him by the size of his head, which was that of a man very much larger than he was. Not only was his head large, but it had a peculiar shape, being rather box-shaped, with a marked projection of the forehead, flattened crown, and a distinct tumor at the junction of the left temporal, frontal, and parietal regions. (See Figs. 1, 2, and 3.) The face was somewhat larger than that of a normal individual of the same size, but was small in proportion to the size of the calvarium. The mastoid processes were large and heavy, and the lower jaw was also disproportionately large, but was not prognathous. The soft parts of the face showed nothing out of the way. Measurements of the head were taken shortly after his admission, and again about a year later. For the purpose of comparison both sets of measurements are inserted here:

	Shortly after admission.	February 12, 1900.
Bitemporal	14 cm.	15½ cm.
Binaural	15 "	14½ "
Fronto-occipital	20 "	20¾ "
Occipitomental	20 "	23 "
Biparietal	17 "	19½ "
Angular	13 "	13 "
Greatest circumference	63 "	63 "
Circumference of vault from meatus to meatus	40½ "	41 "

[1] Read before the Association of American Physicians, 1901.

The head and face, therefore, were rather egg-shaped, with the larger end of the oval pointing upward, as is well shown in the figures. The tongue was of normal size, the vault of the hard palate capacious, but not deep; the alveolar processes were excessively thick. All of the sutures and fontanelles were closed, and showed no depression or ridging. The speech was very peculiar, and practically unintelligible, although not entirely because of ignorance of the language, as an occasional English word could be discerned so thickly emitted that its recognition was almost impossible. The larynx was very large and broad, giving the neck a rather full appearance, but the thyroid gland could not be outlined.

FIG. 1.



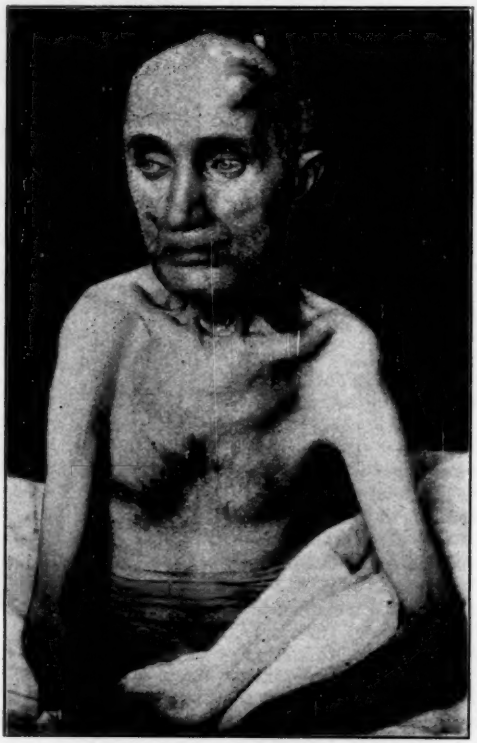
Photograph of subject of report, showing shape of head, frontal tumor, and bony deformities.

A curious alteration of the shoulder girdle was present, due to the fact that, while the clavicles stood out prominently because of thickening of the bones and increase in their natural curves, their direction was almost backward. The upper ends of both humeri, especially the heads, were much thickened, and the natural curves and elevations were very much exaggerated. On both sides there was marked anterior curvature at the level of the deltoid insertion. The elbow-joints appeared to be normal, as were also the bones of the left forearm. In the right forearm there was marked curvature of both bones toward the radial side. On both sides the radius and ulna had a distinctly rough and uneven surface. The appearance of the chest can best be appreciated by a glance at Fig. 2. Above, the chest was small and narrow with the antero-posterior diameter almost equal to the lateral, while below the chest was large and bulging. No substernal dulness could be detected. The xiphoid process was very prominent and broad, and the ribs were distinctly thick and heavy. On each side the tip of the eleventh rib was almost in contact with the crest of the ilium. The costo-sternal angle was very obtuse. There was marked forward curvature of the spine, with very evident thickening of the lower dorsal and upper lumbar vertebræ. Dorsocervical kyphosis was present without scoliosis. The scapulæ were apparently not enlarged.

Examination of the abdomen showed that there was excessive pigmentation of the skin and growth of hair on the anterior surface. Just beneath the costal margin there was a deep transverse furrow extending across the abdomen. The general outline of the abdomen was that of

a diamond, the angles of which were formed by the xiphoid angle, the pubis and the junction of the ribs with the crests of the ilium. The pelvis resembled in shape that of the female rather than that of the male, being very broad and heavy, and the superior basin being very capacious. The distance between the anterior superior spines was 31 cm. The iliac crests were remarkably heavy, and projected far beyond the level of the trochanters. The extreme lateral width of the pelvis

FIG. 2.



Photograph of subject of report, showing size of head, frontal tumor, clavicle, and peculiar shape of chest.

was 34 cm., the intertrochanteric distance being 30 cm., while the patient's total length was only 57 cm. The thigh bones were somewhat large, but were not much deformed, except for the condyles, which were very large. The patellæ were about normal in size. In the skin over the left patellar tendon there was a flat, circular mass of about 2.5 cm. in diameter, apparently situated in the superficial layers of the skin, and giving to the finger the sensation of an enchondroma. Both

tibiæ were greatly increased in thickness, especially on the anterior aspect, the surface of which was rough. This thickening and prominence were more marked on the left side than on the right. The fibula of the left side was decidedly thickened. Both legs showed marked outward bowing, the distance between the knees when the feet were placed together being 7.5 cm. The hands and feet were not enlarged.

In no part of the body was there evidence of involvement of the soft parts. The whole attitude of the patient on standing up irresistibly reminded one of that of the orang-outang.

On his admission the man had a large pleural effusion in the right side. This was withdrawn, and did not reaccumulate. He, however, remained feeble with progressively increasing emaciation and slow growth of the tumor in the frontal bone until his death, about a year after coming under observation.

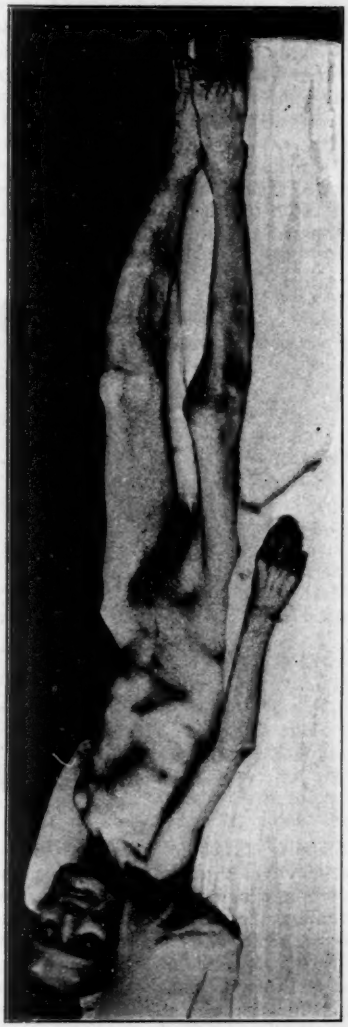


FIG. 8.

Showing especially the separation of the knees when the ankles were in contact.

Autopsy was held twenty-four hours after death. The following notes were made at the time: Rigor mortis is well marked. External conformation as described in clinical notes. On removing the scalp there is found a large subcutaneous tumor springing from the frontal bone to the left of the median line. The tumor is of soft consistence. In places the scalp is remarkably thin, especially in the left temporal region. The outer surface of the calvarium has a rather bluish appearance, and seems somewhat more vascular than normal. The saw cuts very easily through the bones of the skull. The tumor mentioned above is found to measure 4 x 5 cm. at its base, and has an elevation of 2 cm. The calvarium is fairly uniformly increased in thickness, measuring from

1¼ to 2 cm. (See Fig. 4.) The diploë is apparently absent, excepting in the frontal and occipital regions. A little to the left of the median line, at a point corresponding to the superficial tumor, the bone is thickened to 3 cm., owing to the presence in the diploë of a soft growth corresponding in consistence to that seen externally. The growth projects through both the inner and outer tables. The brain is adherent to and almost incorporated with the growth. The whole hollow of the frontal bone on the left side is occupied by a large irregularly rounded mass, of soft consistence, and measuring 5 cm. in all directions. The base of the skull appears large and gross, and all of its concavities are deepened except the sella turcica, which is of about normal size. The inner table of the calvarium is deeply grooved for bloodvessels and freely perforated by small foramina. The base of the brain shows great

FIG. 4.

Calvarium.

overfulness of the bloodvessels. The membranes of the brain seem unaltered over a greater part of the surface, but over the convexity the pia is slightly opaque. In the left frontal region anteriorly to the operculum the brain substance is torn and softened at a point corresponding to the tumor of the calvarium. On the posterior end of the third frontal convolution there are some small whitish granules (sarcoma or tuberculosis?). Similar masses are found bordering upon the longitudinal sinus of the left side.

On the right side there are some old adhesions of the pleura, especially near the apex; the left pleura contains a small amount of fluid. The layers of the pleura on the left side are much thickened, and there is on them a gelatinous substance which partially fills the cavity. A large "milk patch" is present on the anterior wall of the left ventricle. The heart muscle is soft and flabby, but there is no other altera-

tion of the walls or valves. There is an area of atheroma at the root of the aorta. The left lung is almost but not quite airless. The diaphragm on the left side shows irregular thickenings of yellow color looking like sarcoma. The right lung shows only hypostatic congestion. The spleen is large, measuring 13 x 8 x 3.5 cm. The pulp is very soft and the Malpighian bodies prominent. The left suprarenal capsule is thin, and the distinction between the cortex and the medulla is very poorly marked. The kidneys are large and pale, with somewhat prominent vessels, and capsules stripping off readily. The right suprarenal resembles the left except for the fact that there is a post-mortem cavity in the medulla. The liver shows slight distention of the small bile passages; the substance of the organ appears fairly normal. The bile ducts are patulous, and the mucous membrane of the gall-bladder has a normal appearance. The pancreas is rather small, but seems otherwise normal.

Owing to the limited time allowed for the autopsy, it was impossible to remove the spinal cord or the peripheral nerves. It is much to be regretted that preservation of the thyroid gland was for some reason inadvertently omitted. Grossly it showed no change, but it would have been advantageous to have proved its condition by microscopical examination. While changes in the spinal cord described by some observers are probably, as they have pointed out, due to the accompanying arterio-sclerosis, our inability to remove the spinal cord because of lack of time is a source of regret.

Microscopical Examination.—Clavicle. A portion of the bone was taken from about the middle of the shaft of the thickened portion. It was cut with the saw with somewhat greater ease than a normal bone. Decalcification in 5 per cent. nitric acid and phloroglucin was complete in twelve hours, showing the small amount of lime salts in the tissue, as ordinary bone requires from three to four days for decalcification in this solution.

The sections were stained by hæmatoxylin and eosin. The part of the shaft that is usually compact bone substance, with regular Haversian systems, consists of a finely porous structure in which areas of unaffected bone alternate with spaces that are evidently the result of its absorption. These spaces are filled with a fibrous-tissue reticulum. The cells of the spaces are mostly spindle in character; but there are also many round cells, with deeply staining nuclei, polymorphonuclear leucocytes, and a few nucleated red cells, and some fat cells. Most of the interspaces are exceedingly vascular. In many there are networks of dilated capillaries whose walls are but a single layer of endothelium. Larger arteries cannot be seen in the sections obtained. (See Fig. 5.)

The reticulated structure runs almost to the periosteum, and a thin shell immediately under it is the only representative of the compact substance.

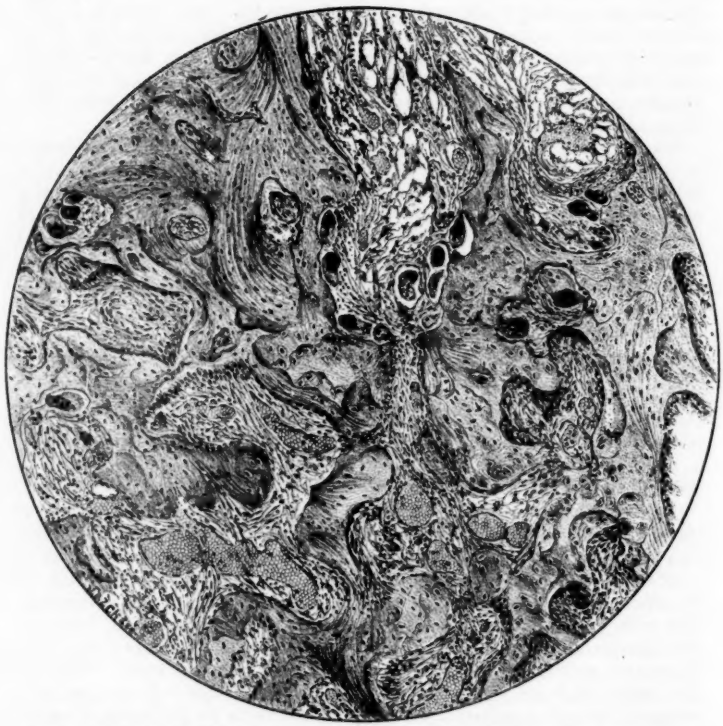
In the interspaces are numerous groups of giant cells with many nuclei. These cells lie in the edges of the unaffected bone, and are apparently engaged in its absorption.

Running through these interspaces and through the bone itself are masses of closely packed cells, resembling osteoblasts, with a fibrous matrix. This is evidently an attempt at the formation of new bone, but in no place is it calcified. The dividing line between the unab-

sorbed and new bone is sharp, and there is every indication that the processes are distinct from one another.

Skull. The distinction between the diploë and outer and inner tables is entirely lost, as far as could be seen from the sections of the bone obtained. There is a thin and irregular plate of compact bone under the periosteum, but elsewhere the bone is honeycombed by absorption spaces, giving it a porous structure. These interspaces (as in the clav-

FIG. 5.



Section of the shaft of the diseased clavicle. Leitz ocular 3, objective 3. The general asymmetry, absorption spaces and the fibrous, medullary substance, containing giant cells and many bloodvessels, are well shown. There are several areas of uncalcified new bone.

icle) are filled by a connective-tissue reticulum containing spindle cells, round cells with large nuclei, polynuclear leucocytes, and a few giant cells. This last variety are not as numerous as in the sections from the clavicle. As in the clavicle, there are bundles of osteoblasts in a fibrous matrix running through the bone and spaces in all directions, evidently representing new bone. The interspaces in the skull are not as vascular as in the clavicle; however, they are well supplied with blood by capillaries. No large arteries are seen in the section. Sec-

tions from the tumor of the frontal bone show it to be a typical giant-celled sarcoma. The mass of the tissue consists of bundles of spindle cells and masses of round cells, but there are also many larger cells with a single, irregularly staining nucleus, and numerous giant cells with five or more nuclei. In general, the sections examined show the following changes:

1. Absorption of the healthy bone.
2. Formation of new bone coincident, but in no way connected, with the absorption process.
3. The failure of calcification in this new bone.
4. The destruction of the regular structure of the bone and the addition of new uncalcified bony tissue.
5. The formation of a giant-celled sarcoma in the affected portion of the skull.

These changes correspond closely to those described by Paget, Stilling, and others who have subjected their cases of osteitis deformans to a microscopic examination.

Suprarenal Bodies. Microscopic examination shows these structures to be normal.

Hypophysis Cerebri. Sections of the hypophysis cerebri show no abnormality.

Nodule from the Pia. Consists of a collection of round and spindle cells with a moderate amount of intercellular substance and with deeply staining nuclei. It is well supplied by bloodvessels whose walls consist merely of a single layer of endothelium. In many places giant cells are found. The nodule is evidently a metastasis from the tumor of the frontal lobe.

The nodule from the diaphragmatic pleura is of the same structure as the nodule in the pia, and has evidently the same origin. It also shows numerous giant cells.

In the literature we find references to ninety-nine cases reported as osteitis deformans.[1] Careful study of these cases shows, however, that four of them were certainly instances of some condition other than even slightly developed osteitis deformans. Twenty-nine may possibly have been instances of this disease, but the facts given were not sufficiently definite to warrant the statement that they were typical cases of osteitis deformans. Many of these reported as instances of this disease were apparently examples of tumors of bone of more ordinary nature, or of osteomalacia or fragilitas ossium, with local enlargement secondary to fractures. Sixty-six cases were found which, in our judgment, are typical instances of the disease described by Paget, in 1877, in an article in the *Medico-Chirurgical Transactions.*

ETIOLOGY. Among the cases so far reported, 41 (including our own) were males, 24 females, and in 2 the sex is not stated. The youngest patient at the time of coming under observation was that of Watson,

[1] Since the presentation of this paper a case has been reported by Atkinson (Maryland Medical Journal, July, 1901). The patient was a male, aged thirty-seven years. The bones affected were the skull, left forearm, and both femora, with considerable deformity. There was no autopsy. The case is apparently one of true osteitis deformans.

whose age was thirty-nine years, while 2 patients (Silcock's and Lloyd's) were eighty-two years old when they were first seen. Moizard and Bourges have, however, reported a patient who was seventy-three years of age when coming under observation, but the disease seems to have quite definitely started at the age of twenty-one. The average age at the time of coming under observation was sixty-one years; the age at the time of onset was capable of determination in 51 cases, and averaged forty-nine and one-half years, the youngest of these being the patient just mentioned, the oldest patient at the time of onset being between seventy-nine and eighty years of age. As will be seen, there is a marked difference between the time of coming under observation and the time when the first symptoms of the disease were noted; 11 of the 51 cases noted had symptoms definitely pointing to the onset of their disease when they were forty years old or younger. It can, therefore, hardly be said to be exclusively a disease of those very advanced in years.

The mental capacity of our patient was but slight. In 1 case from the literature (Joncheray's) the patient and one other member of the family suffered from insanity, while a patient of Lunn's was insane. Inheritance seems to play but a small part in the etiology of the disease, although among the cases which we have studied we found two brothers with the disease reported by Lunn, while Pic and Robinson have each reported a case where the disease was present in two members of the same family.

The etiology of osteitis deformans is, therefore, very uncertain. It is undoubtedly a disease of advanced life, although, as we have mentioned, in eleven of the cases collected the disease began before the age of forty, while in the case of Moizard and Bourges the disease began at as early an age as twenty-one years. The influence of heredity is doubtful. In reviewing the literature there seems no striking evidence of any marked influence exerted by consanguineous marriages, nor does there seem to be any marked neurotic tendency in the families of those suffering from this disease. While a large proportion of the cases are found in English journals, too much importance should not be attached to locality as an etiological factor, as the disease was first described by Paget, and we would expect his countrymen to be more familiar with the disease described by him than those whose attention had not been particularly drawn to the subject. In this connection it is interesting to note how frequently a series of cases are reported in rapid succession in various countries, showing that the mere fact of the public mention of the disease would seem to excite interest in the condition sufficient to cause recognition of other cases.

Symptomatology. The analysis of the cases reported shows that in 14 enlargement of the head was first noted; that in 13 deformity of both tibiæ was mentioned as the first sign of the disease; in 11 the

left and in 6 the right tibia was first involved; while deformity of the spine was first seen in 2; of the right radius in 2; of the right clavicle, lower jaw, and sternum each in 1 case.

Analysis of the cases in regard to the bones affected at the time of coming under observation was not possible in all of the cases. In those where sufficient details were given it was found that deformity was distributed as follows: In 49 of the cases the bones of the skull were involved. (It should be noted that among the 66 cases from the literature 9 departed from the type described by Paget, in the fact that there was no manifest enlargement of the head, 1 of these cases having been

FIG. 6.

FIG. 7.

Fig. 6.—From Paget's original paper. (Medico-Chirurgical Transactions, 1877.)
Fig. 7.—From Paget's original paper. Ibid.

seen by Paget and considered by him a true instance of the disease.) Both tibiæ were affected in 47, the right tibia alone in 2 cases, the left tibia alone in 1 case. In 40 cases both femurs were affected, while the right femur was alone involved in 3, the left femur in 1 case. The spine was affected in 31 cases when they came under observation. In 24 cases both clavicles were thickened and deformed, the right clavicle being affected alone in 3 cases, the left in 4 cases. The bones of the pelvis were affected in 21 cases. In marked contrast to the frequency of involvement of the tibiæ, the fibulæ were found to be affected in only 10 cases. The humeri were symmetrically involved in 14 cases, while

in 3 cases that of the right side and in 4 that of the left side were involved. Both radii were affected in 11 cases, while in 5 the right alone and in 3 the left radius alone were affected. In 10 cases the ulnæ were involved, the left ulna being deformed in 2, while the right ulna was noted in no case as being affected where the left escaped. The scapulæ were involved in 6 cases. The ribs were thickened in 16, while the sternum was involved in 7. In 8 cases it is mentioned that the

FIG. 8.

FIG. 9.

Fig. 8.—From Paget's original paper. (Medico-Chirurgical Transactions, 1877.)
Fig. 9.—Marie's case. (Nouvelle Iconographie de la Salpêtrière, 1894.)

lower maxilla was apparently affected by the disease, while in 1 case it is stated that the bones of the face were involved. In only 8 instances were the patellæ affected. The metatarsal bones were involved in 5, the tarsal bones in 2 cases, and the calcaneus in 1 case. It is seen, therefore, that after the skull the tibiæ are the bones most frequently affected, these being followed by the femurs, spine, pelvis, and clavicles, ribs, radii, and ulnæ. This distribution would seem to rather point

toward the fact that pressure and gravity had at least a large share in the production of the deformities.

While in many of the cases there has been complaint of pain in the bones subsequently affected, our study of the literature would not cause us to attach much importance to this as a symptom of the disease, nor, in fact, has the latter much symptomatology, the results being almost entirely objective.

FIG. 10.

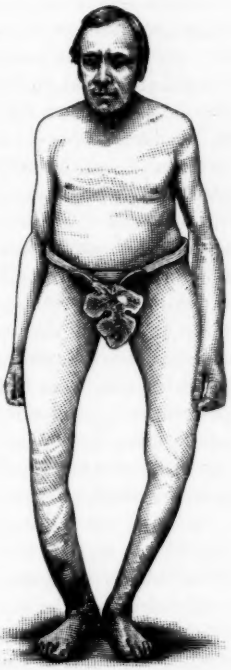


FIG. 11.

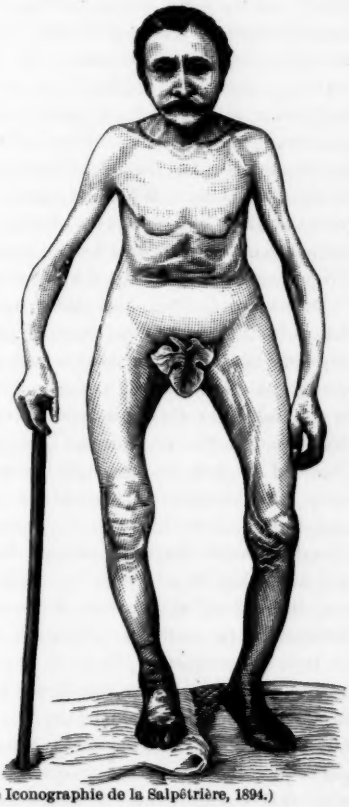


Fig. 10.—A. Robin's case. (Nouvelle Iconographie de la Salpêtrière, 1894.)
Fig. 11.—Gombault's case. Ibid.

So characteristic is the deformity in well-marked cases that it has seemed well for us to reproduce here Paget's original illustrations, with a few others from the literature. (See Figs. 6, 7, 8, 9, 10, and 11.) We would draw particular attention to the diminution in height, the curious deformity of the shape of the chest, the forward bowing of the

head, the lozenge-shaped abdomen, the transverse sulcus running across the abdomen, the broadening of the pelvis, and the outward curvation of the lower extremities. To all these points attention has been drawn by previous writers. They make up a clinical picture which should not escape observation.

The relative frequency of malignant growths, which was first pointed out by Paget in his original communication, and which has been frequently mentioned by later writers as characteristic of the disease, would hardly seem borne out by a review of cases in the literature. Among them we find that 1 case (Clutton's) had a history of cancer in the family. Out of 66 cases, 3 had cancer. Including our own case, making a total of 67 cases, 5 had sarcoma; 2 cases had tumors of non-malignant nature. In 1 case (Lyon's) there was combined osteitis deformans and arthritis. From these facts it would seem that possibly too much stress has been laid on this association in the accounts found in the text-books. When we bear in mind that this disease is especially prone to affect those beyond middle age, it is not surprising that about 4.5 per cent. of the cases had cancer, although the high percentage of 7.5 per cent. of sarcoma must have some significance.

Diagnosis. The chief difficulty in the matter of diagnosis is the determination as to whether a given case of deformity involving but one long bone is an incomplete case of osteitis deformans or whether it should be considered as a purely local affection. In some of the cases in the literature this question cannot be decided. The simultaneous involvement of more than one bone, particularly if the two bones be far removed from each other, and therefore not affected by a possible local cause, should make us suspicious of osteitis deformans, providing no manifest cause, such as syphilis or malignant growth, could be assigned. The differential diagnosis of this disease from others which apparently are somewhat closely allied to it, in being, so far as we can at present see, disorders of the growth of the skeleton, should not be a matter of difficulty. In mollities ossium, to which disease this seems certainly to bear some relation, there is not the same thickening of the bones as is seen in this disease, nor is the head involved. In fragilitas ossium we have deformity produced by the fractures which have taken place, but, except for the thickening around these fractures, there is no hypertrophy of bone. Acromegaly shows but few features in common with this disease, while it differs from it in the shape of the head, in the seat of the deformity and in the character of the latter. In osteitis deformans the cranium is triangular, with the base upward; in acromegaly the base is below, from the fact that in the former disease the calvarium is chiefly involved, while in the latter disease the lower jaw and orbital arches are involved far more than the calvarium. From leontiasis ossium this disease differs in the fact that the bones of the

face are not affected, or only slightly, in osteitis deformans, while in hyperostosis cranii the long bones escape. To giantism this disease has not even superficial resemblance; in fact, the patient's stature is diminished owing to the bending of the long bones and to the almost constant dorsocervical kyphosis.

TREATMENT. Occasionally in the literature the statement is found that the pains accompanying the development of this disease seemed to be relieved by the use of iodide of potassium. In a far greater number of cases, however, the use of this drug has been productive of no relief, and, so far as we could find, there was no evidence of its producing any diminution of the size of the bones in cases which are evidently osteitis deformans and not simply osteitis due to syphilitic infection.

PATHOLOGY. The characteristic features of the morbid anatomy of osteitis deformans can be summarized as follows:

Skull. The distinction between the outer and inner table and the diploë is entirely lost. The entire thickness of the cranium is composed of finely porous bone substance, bounded on the inner and outer surfaces with a thin plate of harder bone. Microscopically the porous substance is seen to consist of a network of thin bony processes. The canals of the Haversian systems are enlarged and confluent, evidently the result of absorption. In the lacunæ, representing the normal medullary substance, are numerous giant cells, leucocytes, and fat cells, contained in a network of vascular connective tissue. Running through the affected areas, and seen as well in the healthy portions of the skull, when such are present, are bands of new-formed bony tissue. The osteoblasts of this new bone, while present in considerable numbers, are not as plenty as in healthy growing bone, and are irregularly arranged. The branching processes of the new canals are shorter than normal or are entirely lacking. The important characteristic of this attempt at regeneration is that the new substance remains uncalcified, and is in time reabsorbed. The border line between the new and old bone is sharply defined, indicating that the two processes are in no way connected. Most observers state that the regenerative process originates in the periosteum, or from the dura, while von Recklinghausen holds that it comes from the medulla. In our own sections the new tissue appears to come from the periosteum.

The result of the combination of these absorptive and regenerative processes is a total destruction of all symmetry in the internal structure of the skull or long bones.

As a rule, the presence of the uncalcified new bone substance renders the cranium softer than usual, but in some places areas of sclerotic bone tissue of ivory-like hardness are found.

In the long bones the normal relation of compact and cancellated structure is entirely destroyed. The outer walls of hard bone are

represented by thin, irregular plates lying directly under the periosteum. In general, the histological picture here is the same as that of the skull, except that the medullary substance is more fatty, and that certain changes are observed that von Recklinghausen classes as retrogressive and progressive. The result of the former is the production of cysts filled with gelatinous substance. The progressive changes produce fibrous tumors or giant-celled sarcomata. The latter are sometimes found in the skull, as in the case here reported, but are rare in this position.

In the bodies of the vertebræ the histological changes are practically the same as in the skull.

A consideration of the morbid anatomy of the various bony structures affected in osteitis deformans readily explains the clinical features of the condition. The thickening of the cranium and of the long bones is due to the formation of a symmetrical new bone tissue. In the long bones and vertebræ the fact that this new tissue remains uncalcified and that the compact substance is being continually absorbed causes weakening, and the bending that results in the characteristic deformity of the disease. The tendency to fracture, seen in osteomalacia, is absent in osteitis deformans, since the presence of uncalcified new bone has a tendency to make the bones elastic and not easily broken.

Etiology. Up to the present time there is no thoroughly satisfactory explanation of the conditions necessary to produce the lesions of osteitis deformans. However, it may be of interest to briefly review the various theories that have been advanced. Von Recklinghausen holds that the process of absorption is a true osteomalacia associated with inflammatory processes, which commences synchronously with the destruction of the bony tissue, and leads to the transformation of the medullary substance into fibrous tissue. From this the processes of new bone grow out. The exciting cause, in his opinion, is mechanical. He bases his theory on the following facts:

1. That the cysts and sarcomata in the medulla, which he considers to be the first manifestation of the disease, occur at those points where the skeleton is most exposed to violence.

2. That the thickening occurs at the points of greatest strain—that is, in the shafts of the long bones and in the vertebræ.

3. That the skull is often affected, because it is exposed to extremes of heat and cold to a greater extent than is the rest of the body. These conditions act largely through their effect in producing contraction in the bloodvessels.

Paget thought that the whole process was inflammatory, associated with absorption, and explains the occurrence of the connective tissue in the medulla as a result of inflammatory hyperplasia.

Stilling thinks that the absorptive process is the result of a rarefying

osteitis with its usual accompaniment, the formation of new bone which, however, remains uncalcified.

Lancereaux has advanced the theory that the new bone formation is an attempt at reinforcement of the long bones which have been weakened by absorption. This view is rendered untenable by the fact that the new tissue is formed not upon the concavity, but upon the convexity of the deformed shafts.

None of the last three authorities advance any theories as to the immediate cause of the disease. The theory that the exciting cause is mechanical renders it necessary to assume some predisposing condition, and up to the present time no satisfactory explanation has been advanced. It has been asserted by some that the process is a trophic one, associated with lesions in the nervous system. Stilling found a periependemal sclerosis in one of his cases. Von Recklinghausen describes masses of round cells around the bloodvessels of the cord in one instance. Gilles de la Tourette and Marinesco and Levi demonstrated sclerosis of the posterior and lateral columns and much degeneration of the bloodvessels of the cord. However, the absence of all clinical evidence of trouble in the nervous system and the results of many examinations that have shown the cord and bone nerves (von Recklinghausen) to be perfectly normal render it unlikely that the lesions referred to have anything to do with the origin of the condition.

Diagnosis. The diagnosis between osteitis deformans and other affections of the skeleton of somewhat similar character is not difficult when based upon a study of the distribution of the lesions and their pathological histology. The disease most closely allied is osteomalacia; indeed, the two affections merge into one another. The main point of difference is that in osteitis deformans synchronously with the absorptive process a process of regeneration takes place. The callus that forms about the fractures that are so common in osteomalacia somewhat resembles the new bone of osteitis deformans, except that it is localized about the seat of a fracture. It often shows a lack of calcification. Moreover, fractures do not occur in osteitis deformans. The absorptive processes of both diseases are practically identical in their origin and appearance.

Leontiasis ossea affects the bones of the face, and the histological picture is that of osteo-sclerosis. The same may be said of hyperostosis cranii and gigantism.

Several writers upon the subject, especially Lancereaux and Richard, have made an effort to show that arthritis deformans and osteitis deformans were different manifestations of the same disease. They claim that both originate in some trophic disturbance, and in one the joints and in the other the shafts of the long bones and the skull are affected. Their evidence has been entirely clinical, and consists of

several cases in which the two diseases appeared to be coexistent. No autopsy upon an undoubted case of osteitis deformans has borne out their theory.

Our conclusions from the study of this case and of the literature of osteitis deformans would be as follows:

A. From the Clinical Stand-point.

1. Beside our own case 66 true cases of osteitis deformans are found in the literature.

2. Osteitis deformans is a distinct disease of obscure etiology, but possibly allied to although not identical with osteomalacia, fragilitas ossium, and acromegaly.

3. The disease is one especially of later adult life, although its onset has been noted at as early a period as the twenty-first year. Of the 67 cases, 61 per cent. occurred in males, 35 per cent. in females. In a small number of cases trauma has seemed to play a part in the etiology. There is very little evidence of a family tendency to the disease, although there are a few examples in the literature.

4. The subjects of the disease bear a striking resemblance to each other in their general characteristics, the most noteworthy features of which are enlargement and forward projection of the head, dorso-cervical kyphosis, the prominence of the clavicles, the spreading of the base of the thorax, the diamond-shaped abdomen crossed by a deep sulcus, the relative increase in the width of the hips, and the outward and forward bowing of the legs.

5. The bones most frequently affected are those of the cranium, the tibiæ, and the femurs, in the two former of which the deformity was usually first noted. There is a curious preponderance of cases wherein the left side was either first or most involved, although at times it was noted that the enlargement was crossed so that the lower extremities of one side while the upper extremities of the other were involved to the greatest degree.

6. The association with malignant disease, while present in our case, would seem to be not quite so frequent as is usually stated.

B. From the Pathological Stand-point.

1. Osteitis deformans is a disease affecting the skull, vertebræ, and certain of the long bones. Its essential pathological characteristics are:

a. Absorption of the compact substance causing enlargement and confluence of the Haversian canals.

b. Formation of new bone which runs diffusely through the affected and the adjacent healthy portions. This new bone remains uncalcified, and is in turn reabsorbed.

c. The conversion of the medullary substance into a vascular connective tissue containing fat cells, giant cells, and leucocytes. In a small proportion of the reported cases cysts filled with gelatinous material and giant-celled sarcomata occur in the medulla.

d. As a consequence of these three processes, the ordinary relations of the compact substance and medulla are destroyed. The bones become exceedingly thickened and asymmetrical, but since the new bone tissue remains uncalcified its elasticity permits of great deformity of the long bones from the weight of the body, and fractures do not occur.

2. The whole picture of osteitis deformans from its pathological aspect is so very characteristic that it must be considered a distinct disease, and its pathological diagnosis is correspondingly easy.

3. The etiology of the condition is as obscure as when Paget first described it. Some predisposing tendency, probably trophic, must be assumed, and the exciting cause may be mechanical; in the skull, extremes of heat and cold, and in the vertebra and long bones the ordinary traumata to which these bones are exposed. Lesions of the nervous system are inconstant and rare, and are probably not a causal factor.

ASYMMETRY OF THE NASAL CAVITIES.[1]

By A. Coolidge, Jr., M.D.,
of Boston.

In this community at least asymmetry of the nasal passages, to a greater or less degree, is so common that it might almost be considered the rule rather than the exception. It is found in those persons who practically never suffer from any disturbance of nasal function as well as in the patients in our clinics. It has been shown by Harrison Allen that asymmetry of the nasal passages may exist without deflection of the septum, but in the great majority of cases a deviation of the septum is the most prominent feature of the asymmetry. The etiology of these deviations, the forms which they may take, their frequency among different races, have been so often and so completely described that I need simply refer to papers by Ingals, Delavan, Bosworth, MacKenzie, Harrison Allen, and Roe, and to the works of Morrell McKenzie, Welcker, Ziem, Stoker, Rosenthal, Sendziac, McDonald, Collier, and especially Zuckerkandl.

In the literature of the subject of deviations of the septum and of asymmetry of the nasal fossæ are frequent references to changes in the shape of the turbinated bodies, commonly found in connection with

[1] Read before the American Laryngological Association, 1901.

these deviations. Of these, the most noticeable is an enlargement of the turbinates opposite the concavity of the septum. Considering the large amount that has been written about the asymmetries of the septum, it is perhaps strange that more attention has not been given to these coincident asymmetries of the other intranasal structures. It is commonly observed that in cases of deflection of the septum the turbinated body opposite a concavity is enlarged and the one opposite the convexity is small. This readjustment is formed partly by changes in size or in shape of the bones, and completed by the soft parts. Not only is the turbinated body as a whole enlarged, or contracted, but localized projections from the septum, as a spur or ridge, may be accompanied by a localized depression in the turbinate opposite to it. By examination of skulls it is evident that these changes are not confined to the turbinates, but often include the ethmoid cells, and sometimes the walls of the maxillary antra.

The etiology of these asymmetries has received the attention of several writers, with varying results. In brief, the causes assigned come under one of three heads: First, that the deviation of the septum is primary, and the accompanying changes in the turbinates are due either to changes brought about by the inspired air current, or to pressure on the turbinate. Second, that deviation of the septum is secondary, caused by a primary change in the shape of the turbinates. Third, that both the deflected septum and the asymmetrical turbinates and outer wall are due to a common asymmetrical development. The enlarged turbinate is sometimes referred to as an accidental pathological hypertrophy, but often it is looked upon as compensatory—as helping to fill up a cavity which would otherwise be too open.

Nineteen years ago Delavan, in a paper on "The Question of Hypertrophy of the Osseous Structure of the Turbinated Bodies," discussed the hypertrophy of bone as well as of soft parts, especially in connection with deflected septa. I do not know that there is to-day a better argument on that subject. He points out the peculiar intimate relations between the mucous membrane of the turbinated body and the bone, and concludes that "the conditions favorable to the hypertrophy of the turbinated bone would seem to be (1) unusual space in the nasal fossæ; (2) long-continued hyperæmia of the structures investing the bone; (3) the existence of the above conditions during the period of greatest constructive activity."

Bosworth says: "It is necessary for the development of these hypertrophic changes that air should pass through the fossa. We, therefore, find it an invariable rule that the greatest extent of hypertrophy develops on that side which is most open, for in no case of a deflected septum is the extra width of one passage competent to supply the deficiency of the other."

Bryan, while following Bosworth's view of the influence of the air tension in producing hypertrophy, protests that it seems overdrawn. Greville McDonald considers that there is both a true hypertrophy and an engorgement of the inferior turbinated body, and that it would appear to be a physiological attempt to compensate for the abnormal width of the fossa, and should not be lightly interfered with.

Lennox Browne regards the hypertrophy as compensatory rather than as simply pathological. He says: "Deflections, while causing stenosis of the meatus into which they protrude, naturally increase the patency of the opposite side; but increase of function is apt to render the turbinated bodies on this open side liable to compensatory hypertrophy. This secondary overgrowth or vascular turgescence may take place to such an extent that stenosis will be produced, which will demand treatment; but it often happens that a deviated septum having been rectified, the compensatory hypertrophy of the turbinals of the opposite side will spontaneously undergo partial and sufficient resolution."

Roe points out that as the air in respiration should be equally divided between the two sides, the hypertrophy may be a compensation of nature for this extra work. He says: "The hypernutrition has been caused by the irritation consequent upon the excessive amount of air passing through the unobstructed passage."

Ziem, in 1883, traced a connection between unilateral nasal obstruction and nasal and facial asymmetry. By obstructing one nasal passage in young animals he concluded that the restriction of respiration retards, and functional activity increases, the development of the nasal structures.

During the last few years renewed attention has been directed toward the influence of a restriction of the normal air current on the development of the bones of the face and nasal passages. It has long been very commonly accepted that adenoid hypertrophy in the vault, by restricting respiration, is the principal cause of certain peculiarities in the development of the facial bones. This has, to a greater or less extent, been doubted or denied, especially in the last five years, by Fränkel, Siebenmann, and Grossheinz, who conclude that the high arch and narrow face are together forms of skull development independent of nasal stenosis. So far as normal development is dependent upon normal function, we should expect asymmetrical development in cases of unilateral obstruction to respiration.

An interesting study is offered by certain reported cases of congenital occlusion of the posterior nares by a bony plate. In some of these cases the occlusion was unilateral, in others bilateral. The patients had lived since birth with absolutely no passage of air through one or both nasal passages.

An extreme advocate of the influence of the air current as the causative factor in abnormal development of these bones should expect to

find symmetry, but extreme high palate in cases of bilateral occlusion and marked asymmetry where the occlusion was unilateral. That such is seldom the case shows that other elements must be considered. In most of the reported cases, although the facial and nasal index have been carefully measured, I have not been able to find very satisfactory descriptions of the relations of the turbinates to the deflections of the septum. I have myself seen two cases of choanal occlusion, one bilateral, the other unilateral.

The first case, bilateral, has been reported by Clark. A girl, aged eighteen years, had been unable to breathe through the nose at all since birth, on account of the complete occlusion of both posterior nares by bony plates. The septum was markedly deflected to the left, forming a concavity in the right nasal chamber. The right lower turbinated bone was enlarged and projected toward the concavity. On the left side there was a ridge on the septum and a small and retracted turbinated body.

The second case was a Swedish girl, a domestic, aged eighteen years. I first saw her in September, 1897. She had never been able to breathe through the right nostril. She breathed easily through the left side, and was not obliged to open her mouth except on exertion. The posterior rhinoscopic mirror showed a normal choana on the left; on the right was a smooth surface, with no visible line separating it from the vault or from the septum. This was a bony plate, which I subsequently removed. There was no marked high arching of the palate, nor facial asymmetry. The left nasal cavity was normal, except that the septum was deflected to a moderate extent into this side, with a corresponding concavity in the occluded right side. The lower turbinate in the left side was retracted, leaving good space for respiration. In the right side the lower turbinate bulged toward the concavity to an extent which made it slightly difficult to reach the obstruction with straight instruments. The soft parts of the turbinated body were somewhat pale and collapsed, but the bone in general followed the curve of the septum.

Haag has collected the reports of 44 cases of occlusion of the choanæ, of which 20 were bilateral and 16 right-sided and 8 left-sided. In only 3 of the unilateral cases was there marked facial asymmetry. In 1 of these the septum was straight and the nasal passages were of equal size. In 5 of the unilateral cases the septum deviates toward the occluded side. In the others it is either normal or not mentioned. In 1 bilateral case there was facial asymmetry, and in at least 2 deviation of the septum. Subsequently, Morf and Baurowicz have reported cases with the same conclusions. In many of the cases reported the turbinates in the obstructed nasal cavities were normal except that they appeared pale.

These cases tend to prove that the influence of the respiratory air current, or functional activity, on the development, or on pathological changes in shape of the intranasal structures, is at least limited. In

a case reported by Dr. C. H. Knight, in 1888, and in similar ones by Schoetz, Anton, and Simon, of unilateral occlusion, the concave side and the large turbinate were found on the unobstructed side. Here it might be argued that the hypertrophy was caused by the air current, but in most of them the deflection was slight, and the single nasal passage admitted sufficient air for nasal respiration. In my case the septum was deflected toward the unobstructed side.

That the adjustment of the turbinates may be due to the increased or diminished space in the nasal passage has already been referred to. A temporarily engorged turbinated body might be compressed by a convexity of the septum or by a spur sufficiently to affect its growth, or in the concave side, meeting no resistance, it might be stimulated to increased growth. This might be communicated to the ethmoid cells, so that they also would take part in the process. If we accept this as a sufficient explanation, we must acknowledge that the ethmoid and turbinated bones are especially endowed with a very sensitive nutritive adaptability.

Baumgarten, Woakes, Seiler, and others have suggested that the deviation of the septum may be secondary to the enlargement of the turbinates. This view seems to have many arguments against it. It is hard to see why the turbinated bones of the two sides should so act in harmony; neither is it likely that a part of a lower turbinated bone receding from a spur should be the cause and not the effect of the spur. Also, the septum is especially liable to deformity anterior to the turbinated bones, where the external nasal walls are symmetrical and unyielding. Cases of atrophic rhinitis may present deviations, although the type of face in which ozæna most frequently occurs is that in which asymmetry of the fossæ is least common. That an abnormally large middle turbinate may deflect the septum, and this in turn cause a retraction of the middle turbinate and ethmoid cells of the opposite side, is suggested by Zuckerkandl in connection with one of his plates.

It has also been suggested by Welcker, Ziem, Schaus, and others that neither of the deformities is secondary to the other, but that both are the result of a general asymmetry of the whole region. Bosworth, commenting on the observation of Schaus, speaks of "scoliosis, as it were, of the whole face." Ingals, in 1882, showed a relationship between deviations of the external nose and of the septum. These irregularities either first appear or are much increased during the growth of the intranasal structures at about the time of puberty. Walsham says briefly: "The vomer is pushed downward and forward by the rostrum of the sphenoid, carrying with it the perpendicular plate of the ethmoid, together with the nasal bones and the external table of the frontal, to which these are attached. If anything interferes with this forward extension it will cause deviation of the septum."

Whatever the mechanism may be by which one intranasal structure is modified to fit another, there seems to be no doubt but that nature has some method by which the air-carrying capacity of the two sides can be kept approximately equal. The following, from Sir James Paget, quoted by Delavan, seems appropriate here: "Hypertrophy of bone presents itself in many interesting cases. It is usually a secondary process, ensuing in consequence of change in a part with which some bone is intimately connected. Just as in their natural development and growth the bones of the skull are formed in adaptation to the brain, and those of the limbs are framed to a fitness of the action of the muscles, so in disease they submit in their nutrition to adapt themselves to the more active parts." As the function of the nose is to transmit and modify air, should we not expect to find the bones adapting themselves to this function?

The delicate physiological balance of the nasal organ is well known. The size and shape of the air-carrying passages in the nose are of the greatest importance for its proper physiological functions. This physiological balance would be entirely destroyed by a deviation of the septum unless a corresponding anatomical balance were established. As can be seen on a cross-section through symmetrical nasal chambers, even a slight deflection of the septum would open one passage and narrow the other, so that a large proportion of the air would go through one side. May we not assume, then, that if asymmetry is present in one structure, asymmetry of neighboring structures must be looked upon as physiological rather than as pathological? In other words, these secondary changes subtract from rather than add to the departure from typically perfect conditions.

In a nasal cavity in which this adjustment has not taken place, where, for instance, a turbinate opposite a concavity is small, leaving a wide passage, there is always present some pathological change, or at least a disturbance of function. Also, in the opposite or narrowed cavity, unless the turbinate recedes, there must necessarily be an appreciable obstruction to the passage of air. The greater the deviation the more the nasal passages become defective as an organ for respiration. Compensatory shrinking is limited on the convex side, and the hypertrophy of the concave side often becomes excessive. In front of the turbinates, where the cartilaginous septum may bend toward an unyielding nasal process of the superior maxilla, there can be no readjustment, and a sufficient deflection of the septal cartilage causes a unilateral obstruction perfectly obvious to the patient. Many cases of obstruction requiring operative interference, and most of the methods for straightening the septum come under this head. The object of these operations is to open a passage into the nasal cavity proper.

So well is the function maintained that most persons with deviating

septa, provided the deviation is not so far forward as to block the passage anterior to the turbinates, are unable to tell which nasal cavity has the greater capacity, and no one, surely, is surprised to find many asymmetrical nasal passages in persons who never have the slightest trouble with their noses.

Turning briefly to the practical bearing of these large turbinates where, on account of obstruction to breathing or for other cause, it is advisable to straighten the passages, we are told by some of the writers whom I have quoted that the large turbinate should be reduced before the septum is straightened, by others that nature's process of readjustment will be sufficient to take care of the redundancy of the turbinate. My belief is that there is truth in both assertions, each in its proper case. To one rule of treatment I think that there will be no question. A turbinated body should be judged by the distance between it and the septum, and not by its absolute size.

In closing, I would present the following propositions for discussion:

1. In cases of deviation of the septum, the common asymmetries of the other intranasal structures should be classed as physiological compensatory changes.

2. As a rule, these changes in the turbinated bodies and ethmoid bone are not due to increase or diminution of the air current. Neither is the deflection of the septum often secondary to asymmetrical turbinates.

3. Whatever may be the mechanism which underlies this adjustment, the ethmoid and the turbinated bones are especially endowed with nutritive adaptability, and in consequence are able to minimize the disturbance which a deflecting septum would produce. Slight deflections are often rendered entirely innocuous, more extensive ones partially so.

4. The entrance into the nasal cavities proper cannot share in this readjustment, and here a deflection of the cartilage of the septum soon becomes obstructive.

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A CASE OF ACUTE LEUKÆMIA PRESENTING SOME INTERESTING FEATURES.[1]

By D. D. Stewart, M.D.,
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The accompanying case might not be deemed worthy of report because of the incompleteness of the record were there not very special features of interest that demand its publication. The patient was in the writer's wards of the Episcopal Hospital, in the spring of 1899, for thirty days prior to her death.

She was admitted with symptoms which, several inspections of the blood showing evident leukopænia, caused the diagnosis of scurvy to be made. These were: Spongy, hemorrhagic gums, with looseness of the teeth, fetid breath and furred tongue, an anæmic appearance, and a tendency to nose-bleed. The patient had been debilitated since the birth of her last child, three months before, and the above symptoms had since developed. Appropriate treatment for scorbutus was ordered, and but little further attention was paid to the case until she was well into what appeared to be an attack of typhoid fever.

The history is as follows:

Ann S., aged twenty-eight years; birthplace, Philadelphia; occupation, housework. Admitted to the Episcopal Hospital on April 11, 1899. Died on May 11, 1899.

Family History. Father said to have died of heart disease; mother of insanity. Otherwise, family history negative.

Previous History. Had measles when a child. No other infectious disease. Fairly healthy until lately, save that she had had a bad diarrhœa after the birth of one of her children. No specific history; never had had chills and fever. Married for nine years; five children; last child born three months before admission. Had nursed child for one

[1] Read before the Association of American Physicians, 1901.

month. She was of slender build, and her complexion was said to have been always pallid.

Present illness began some two or three months before (about February, 1899), shortly after the birth of her child. Then the gums became swollen and bled easily. There has since been a tendency to nose-bleed, but no hemorrhage from other parts of the body. On admission it was noticed that the patient presented a rather anæmic and markedly ill-nourished appearance, which she said was habitual with her. There was a history of overwork and privation. The gums were much swollen, soft, and spongy, almost covering the teeth in places, and tended to bleed easily. There had been no salivation, and she had not taken calomel. The teeth were quite loose, and the breath very foul, the tongue swollen and furred. The heart sounds were enfeebled. No murmurs were present. Indications of enlargement of the external lymph glands were not evident, and the area of splenic dulness was little increased over the normal.

An inspection of the blood by Dr. Ghriskey, on several occasions during the first week of admission, invariably showed a diminished number of leucocytes, a number of fields having to be covered for one to be seen. Red corpuscles pale, not distorted. No estimation of red or white corpuscles was then made.

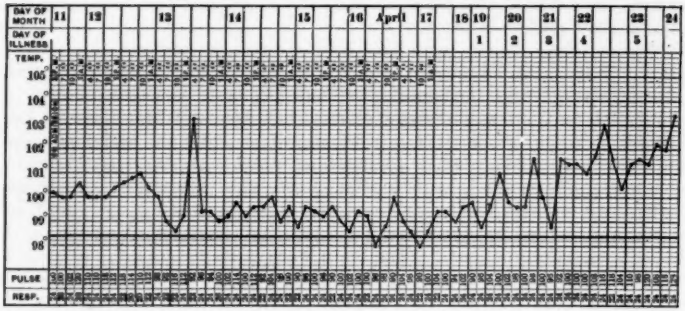
An astringent mouth-wash was prescribed. She was given a nourishing diet, containing such green vegetables as could be procured, and expressed meat juice and lemonade. Tincture of iron in syrup of lemon was prescribed, and a moderate amount of strychnine and whiskey ordered. Her temperature from the day of her admission is as recorded on the accompanying chart.

On the day of her admission (April 11th) and that following it varied from 100° to 101°, reaching 103.1° on the 13th, but subsequently, until April 19th, it did not exceed 100°. It had then begun to show a gradual rise suggestive of typhoid fever.

There was a great deal of typhoid fever in the wards at the time, and, coincident with the occurrence of the more or less characteristic temperature rise, it was suspected she was developing this disease. During the latter part of April her spleen, which on admission had not been palpable, became notably so. There was diarrhœa, and spots appeared on the abdomen, which superficially resembled the rash of enteric fever, and on May 2d the blood was reported to give a typical Widal reaction. The examination was made at the City Laboratory by Dr. A. H. Stewart from a dried specimen. Unfortunately, a second specimen was not sent. The abdomen had become distended, and there was marked tenderness in the right iliac region.

On May 7, 1899, it was noted that the rash had become general, and was unlike that of typhoid fever. The spots had much increased in size, and in places were becoming purpuric. Much aching was complained of in the extremities. The breath was highly offensive; the gums hemorrhagic and sloughing at several points. The heart sounds were much enfeebled. The spleen had become much enlarged, and was palpable two finger-breadths below the costal margin. The bowels were now very loose. An inspection of the blood, which had not been made since the first week of admission, showed an extensive leucocytosis, the large mononuclear cells prevailing. The report was: Leucocytes, 89,600; erythrocytes, 1,280,000; hæmoglobin, 25 per cent.

1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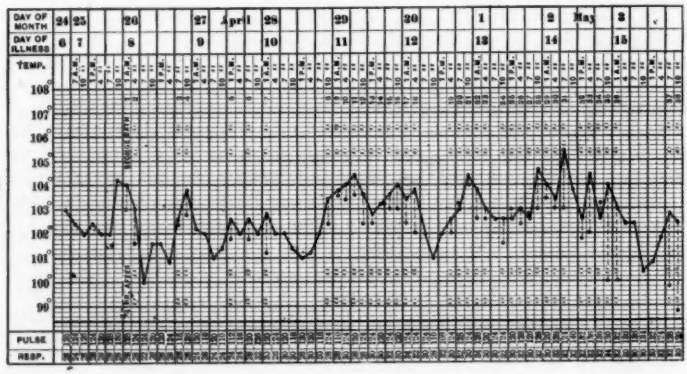
2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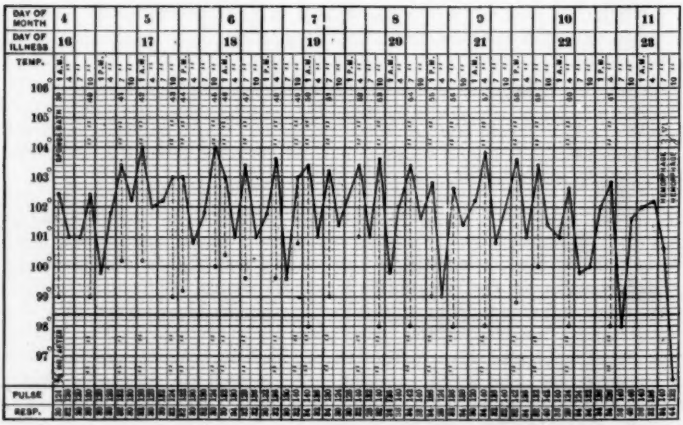
DAY OF MONTH
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PULSE
RESP.

Urine (catheterized specimen) turbid, contains numerous whitish flakes in suspension; reaction acid; albumin, marked trace to heat and acid; microscopically, numerous leucocytes singly and in clumps; granular and epithelial casts; many erythrocytes.

On May 9th it was noted that the purpuric rash had become more or less general, and tended to be confluent. Leucocyte estimation, 102,000.

11*th*. Leucocyte estimation made, but report missing. It is recalled that the count was considerably in excess of that of the 9th instant. She had a moderate hemorrhage from the bowel on the evening of the 10th, and a very large one the following morning. This was followed by symptoms of collapse. Despite repeated hypodermoclysis and other measures to restore her, she died on the evening of the 11th. In the last week of the illness diarrhœa was excessive.

Pathological Report by Dr. Robertson.

"Necropsy made six hours after death. Body of a rather emaciated woman. Purpuric spots over abdomen. Gums soft and swollen, and overlapped teeth more than normally. Subcutaneous fat greatly diminished. Musculature very poor.

"*Thorax.* Pericardial fluid normal in appearance and amount. Heart muscle pale and flabby. Valves and orifices normal. Weight, 256 grammes. Hemorrhagic foci on visceral layer of pericardium. Lungs: Calcareous nodule in apex of right lung, otherwise both are normal throughout.

"*Abdomen.* Stomach low in position. Kidneys: Both movable, the right one freely, the lower margin being on a level with the crest of the ilium, though some attachment still remained, being formed by the original perirenal tissue, which had been converted into a long band. Both kidneys pale on section, cortex widened, due to parenchymatous degeneration. Right kidney weighed 208 grammes; the left 256 grammes. Liver enlarged, rather pale, seat of parenchymatous degeneration. Spleen much larger than normal; weight, 432 grammes. Quite firm, unlike that which one finds usually in typhoid infection. Intestines: small bowel contained no ulcers. Peyer's patches distinctly visible, owing to numerous small pigmented spots within them. There were no signs of inflammation anywhere. The cæcum, ascending and transverse colon contained numerous deep, ragged ulcers, many with black, hemorrhagic sloughs, partly separated. A few of the ulcers were perilously near perforation, the serosa alone remaining, and this latter, on its peritoneal surface and the juxtaposing peritoneum, was congested and roughened. Blood clots were found in the large bowel. These ulcers did not resemble any typhoid ulceration that I have ever seen. They were very irregular in outline, and the erosion itself seemed to have progressed with varying degrees of rapidity in the same ulcer, hence the bosselated character, the unevenness of the base. The appendix, which was very long, contained two small ulcers near its tip. Unfortunately, no special study of the bone-marrow was made, the ribs and sternum alone being examined, and here it was normally of the red variety. The inguinal, mesenteric, and peribronchial lymph glands were enlarged and firm.

"Microscopically the ulcerated portion of the intestine appeared as follows: The mucosa was completely necrotic, and sections stained with thionin showed numerous micro-organisms, chiefly bacilli and strep-

tococci. These had not penetrated very deeply into the submucosa. The lymphoid tissue had been infiltrated with plasma cells and large and small lymphocytes, so that as a matter of fact the normal adenoid tissue had been obliterated. Numerous plasma cells and mast cells were found scattered throughout the submucosa.

"*Spleen.* Vessels thickened. Malpighian corpuscles much less marked than normally, being apparently largely displaced by the very richly cellular parenchyma. Plasma cells and large endothelial cells seem to make up the large part of these. No bacteria could be found.

"*Lymph Gland.* The normal arrangement of a lymph gland is totally lost. It is very rich in cells, plasma and endothelial cells, the latter apparently descendants of the cells lining lymph vessels and spaces. Small and large lymphoid cells, aggregated into groups and surrounded by attenuated fibrous tissue, an approach to the normal, were only found at the periphery of the gland. No micro-organisms found.

"*Liver.* Parenchyma cells swollen and granular, the seat of parenchymatous degeneration. No increase of connective tissue or bile ducts, but here and there aggregations of lymphocytes and connective-tissue cells.

"*Kidney.* Seat of parenchymatous degeneration. Moderate congestion. About the glomeruli and between some of the tubules, particularly in the neighborhood of the glomeruli, were aggregations of plasma cells and large lymphocytes.

"*Heart.* An interstitial collection of plasma and connective-tissue cells, and a few lymphocytes. Muscle fibres stain well.

"From the histological examination the picture is that of any of the acute infections, plus the great increase of lymphocytes. The plasma cell has been found particularly in typhoid and diphtheria, but is met with in other infections also, though I scarcely think in as great numbers. How large a part they play in scurvy or acute leukæmia I do not know."

Specimens for microscopical examination were also submitted to Prof. Simon Flexner. The following is his report:

"*Intestine.* The section of intestine consists of a nodule equally within the mucous membrane and the adjacent tunics, including a portion of the omentum. The nodule occupies the whole of the mucous membrane as far as contained within the section, with the exception of a fragment of tissue at one end, in which the crypts of Lieberkuehn are still present. With this latter exception the entire tissue is degenerated and refuses to take the staining agents. The remainder of the membrane is made up of cells separated by a stroma, in some places coarse in texture and in others fibrillar. The degenerated edge goes over quite sharply into the cellular layer, and there the line of demarcation is occupied by brightly staining cells and intercellular tissue.

"As regards the preserved portion of the cellular infiltration, it consists of cells of large size, possessing vesicular nuclei, the latter being reticulated, and an abundance of protoplasm. Among these are small cells resembling lymphoid cells in all particulars. Many of these cells show karyokinetic figures. These figures are especially marked in the large cells described. They exist throughout the nodule, are about uniformly distributed, and in the preserved edge of the tissue, just below the

degenerated tissue, are present as described. These dividing cells show all stages from the simple dividing aster to the completely divided nucleus; rarely four or five nuclei are found contained within a single cell. The infiltration described involves the mucous membrane and submucosa, so that no distinction can be made out in these two tunics. The muscular coat, on the other hand, is less uniformly affected, but in it are islands of cellular tissue, presenting the same characters as those of the mucosa and submucosa. The cells composing the nodules are made up chiefly of the larger cells described. Among these there is also evidence of karyokinesis. The peritoneal coat is very diffusely infiltrated with similar large cells, chiefly, although some of the smaller lymphoid cells are also present, and cell division is going on among these cells. The bloodvessels, chiefly of the muscular coat, show an increase of white elements, especially of larger white elements with single nuclei, and it is found that nodules in the muscular coat had developed about such bloodvessels and perhaps also about lymphatics. The type of large cell agrees with the type of large mononuclear leucocyte as found in the blood, and they may be considered as being alike, inasmuch as those within the vessels agree with those without the vessels. That the nodules have arisen, at least in part, by proliferation *in situ* is shown by the active karyokinesis.

"*Mesenteric Gland.* Section of this gland shows that it is not greatly enlarged. Upon microscopical examination there is seen hyperplasia of the entire gland, which largely obliterates the distinction between the cortex and medulla, and in which there are numbers of cells having the general characteristics of large mononuclear leucocytes. In these cells karyokinesis is also apparent.

"*Spleen.* Shows a considerable amount of yellow blood pigment. It is uniformly infiltrated with cells; rarely can a Malpighian body be made out. The cells are of the type of lymphocytes, the larger ones chiefly being represented. Cellular accumulations are found, especially in the pulp. Karyokinesis also appears in the large cells.

"*Liver.* The cells are granular. The capillaries contain a greatly increased number of white elements, which partake especially of the character of lymphocytes. In addition to which there are scattered nodules of cells surrounding branches of the hepatic veins especially, consisting of large lymphocytes admixed with a small number of small lymphocytes. These occupy the sheath of vessels and extend into the liver tissue and take in part its place. Karyokinesis is also to be seen among these cells.

"*Kidney.* Shows swelling and granular degeneration, and some fatty degeneration of the tubular epithelium. It also shows small hemorrhages into the tubules, and focal accumulations of the large mononuclear elements within the kidney substance, chiefly about the glomeruli.

"*Heart.* Section of heart muscle shows, first, an increase in fibrous tissue about the larger bloodvessels; second, focal accumulation of cells, chiefly of the type of lymphocytes between the muscle fibres. These accumulations are often elongated, adapting themselves to the spaces between the fibres. An occasional nucleus, such as are found in polymorphonuclears and an occasional red cell, are also found.

"*Diagnosis.* These sections come from an undoubted case of lymphatic leukæmia of the large mononuclear type. The bloodvessels

contain greatly increased numbers of these mononuclear elements. From the bloodvessels they have escaped into various situations of the body, especially into the intestinal mucosa and submucosa, where they have developed with the production of leukæmic nodules."

A differential blood count was made for me by Dr. Thayer, of the Johns Hopkins Hospital, for which I here express my great indebtedness. It is as follows:

"The specimen of blood which you sent me is very remarkable. It is clearly an example of large-celled lymphatic leukæmia. I have seen similar bloods in two instances of very acute lymphatic leukæmia, in one associated with hemorrhagic and extensive areas of cutaneous gangrene. The type of blood is that which, in my experience, is associated with the most rapid and malignant type of lymphatic leukæmia. The two specimens were stained, one with Ehrlich's eosin hæmatoxylin, the other with the triple stain. In the first place the specimens stained badly. Whether with the triple stain or with other stains the ground substance between the different cells takes a distinct color, a slight, diffuse lilac stain in specimens stained with the triple stain, and a more reddish color in the eosin hæmatoxylin specimen. This is especially marked round about each leucocyte. The red corpuscles show moderate variation in size, a slight, though not great, poikilocytosis. No nucleated red blood-corpuscles were seen. There is a great increase in the number of leucocytes, which are almost entirely mononuclear. Many of these, however, show nicks and divisions in the nucleus, for the most part not like those occurring in the ordinary development of the polymorphonuclear leucocyte. The most striking feature about the specimen is the almost absolute lack of granules. Scarcely a single element containing undoubted neutrophilic granules has been found. After considerable search a single eosinophile was seen. The mononuclear elements consist of typical small lymphocytes with deeply staining nuclei, which nearly fill the cell body, and of elements larger than these all the way up to bodies larger than the ordinary polymorphonuclear cells. These, as has been said, show in many instances nicks which are sometimes deep, so as occasionally almost to divide the nucleus in half. On account of their general similarity in character to the larger mononuclear cells, these have all been classed as mononuclear elements. The protoplasm of some of these elements is deeply staining, of a brownish or slightly lilac color, of others with grayish, and of others nearly colorless. The number of cells with nuclei like those of the ordinary polymorphonuclear leucocyte was small. A differential count of a thousand leucocytes showed: Typical small lymphocytes, 16 per cent.; mononuclear elements smaller than the ordinary polymorphonuclear leucocyte, usually with palely staining nucleus, some showing nicks as above referred to, 22.4 per cent.; cells as large as polymorphonuclear leucocytes or larger, with a nucleus usually palely staining, 55.6 per cent.; cells with distinct polymorphous nucleus, and some showing a suggestion of granulation, but no positive neutrophilic granules, 6 per cent. No nucleated reds or eosinophiles were found among the thousand counted."

An analysis of this case has been puzzling to me. At the time of its observation my notion was that, on admission to the hospital, it was one of scurvy, that typhoid infection had then occurred, and that the

acute leukæmia had appeared as a complication of the presumed typhoid fever. The patient had been ailing for two or three months, and on admission her gums were spongy, much swollen, and hemorrhagic, and the teeth loose. Yet several inspections of the blood by Dr. Ghriskey, whose careful technique is well known, showed an evident leukopænia. It is well known that in ordinary spleno-medullary leukæmia there may be periods in the course of the disease in which, with or without extensive splenic enlargement persisting, the leucocytes approach the normal in number, or even fall below, and that the separation of such a case from ordinary splenic anæmia must be made by the persistence of myelocytes in considerable number. Ordinarily, lymphatic leukæmia is acute in onset and course. In the less common chronic cases there are, I believe, no observations showing the intercurrent existence of periods in which the leucocytes diminish to normal or fall below, and in which a high percentage of lymphocytes persists. With glandular enlargement evident, such a case would be indistinguishable from Hodgkin's disease, in certain cases of which there may be an increased percentage of lymphocytes without the total number of leucocytes being above the normal. In the present case it is difficult to conceive lymphatic leukæmia without leucocytosis and without evident external glandular enlargement, which in this case did not exist on admission, and only occurred toward the termination of the case. There, then, was moderate swelling of the cervical, axillary, and inguinal glands. In the present case I am forced to conceive a preleukæmic blood state in which, without leucocytosis, if a differential count had been made on admission, a high percentage of lymphocytes would probably have been found to exist. But as a lymphocytosis may occur in scurvy, the diagnosis of possible leukæmia would have been favored less by this than by the febrile temperature and the lack of prompt improvement in the case under an anti-scorbutic regimen. The woman was of the lower class; had for years overtaxed her strength and had been ill-nourished. She had just passed through gestation and a month of lactation, so that the conditions were favorable for the development of any morbid blood state. Bearing in mind the aping of the clinical picture of typhoid fever by acute leukæmia, it is still conceivable, though not altogether probable, that this patient had, preceding the development of undoubted acute leukæmia, a typhoid infection. Certainly spots appeared which were regarded as similar to those of typhoid,[1] and the blood was reported by Dr. A. H. Stewart, of the City Laboratory, who has had an extensive experience in such examinations, to give the typical Widal reaction.[2]

[1] But of the minute character of which no record exists, as the condition then was thought to be typhoid fever.

[2] The Widal reaction was examined for but once, and from a dried blood specimen. We had not then begun such examinations at the hospital.

Unfortunately, cultures were not made in life or after death to determine the existence of the typhoid organism. The importance of such cultures was recognized. They were requested repeatedly, but in the very large amount of detailed labor then thrown on Dr. Ghriskey in the organization of the clinical laboratory, then in its incipiency, and who was working without an assistant, they were omitted.*

The post-mortem picture was that of an acute severe infection. The ulcers, the erosion of a vessel of one of which had caused the fatal hemorrhage, were limited to the colon. Dr. Thayer's report of the blood condition is especially interesting, in that it shows the case to belong to a type of very acute malignant leukæmia. This argues against the existence of the disease nearly four months before, at the time of the appearance of spongy gums, and with the absence of a leucocytosis on admission to the hospital a month before. My own judgment is, viewing these and other facts in the case, that the leukæmia was but in its incipiency on admission; that it had very acute onset, with the gradual rise in temperature suggestive of typhoid fever; that the earlier conditions represented a blood dyscrasia allied to scurvy, upon which the very acute and fatal leukæmia was subsequently engrafted.

TYPHOID CHOLECYSTITIS, WITH OBSERVATIONS UPON GALLSTONE FORMATION.†

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Although cholecystitis occurring as a complication of typhoid fever was recognized by Louis, it has not been carefully studied until recent years. In this country the important monographs published in 1897 by Drs. Osler[1] and Mason[2] have directed attention to this serious and not uncommon complication.

We are realizing more and more the important rôle the typhoid bacillus plays in producing pathological processes in various organs and tissues, and the list of the complications and sequelæ of typhoid fever due to the specific bacillus is still increasing.

It was not until 1887 that it was definitely known that Eberth's bacillus could produce a suppurative inflammation. In that year A.

* The hospital at this time was much overcrowded. Beside the usual run of cases, there were, coincidently, seventy-eight cases of typhoid fever. This service naturally entailed, both on myself, Dr. Ghriskey, and the residents, an excessive amount of routine work, and more than could be adequately well done.

† Read at the first annual meeting of the American Association of Pathologists and Bacteriologists, Boston, 1901.

Fraenkel[3] obtained this micro-organism in pure culture from an encapsulated peritoneal abscess.

The original demonstration of the occurrence of the typhoid bacillus in suppurative cholecystitis was made by Gilbert and Girode[4] in 1890.

Louis,[5] writing in 1829, said that changes in the bile and gall-bladder are much more frequent in the course of typhoid fever than in any other acute disease. Quincke,[6] in his recent article in Nothnagel's *System*, bears witness to the truth of this statement.

In health the bile* is sterile; but the old idea that it possessed marked antiseptic properties has been overthrown. Fraenkel and Krause,[9] Miyaki,[8] and others have shown experimentally that the bacillus typhosus and the bacillus coli grow luxuriantly in normal bile.

The gall-bladder is a favorite habitat of the typhoid bacillus. During the past four years at the Boston City Hospital we have made cultures from the gall-bladder in thirty autopsies upon cases of typhoid fever. In twenty-one the bacillus typhosus was obtained. In one of these cases there was a catarrhal cholecystitis; in all the others the gall-bladder and bile appeared normal. In five of the nine negative cases the bacillus typhosus was not found in any of the organs. Chiari[10] found the typhoid bacillus in the gall-bladder of nineteen out of twenty-two patients who died of typhoid fever. Osler[1] states that Flexner found this micro-organism in the bile in seven out of fourteen cases. There was no clinical or pathological evidence of cholecystitis in any case in his series.

As the gall-bladder in typhoid fever usually contains the typhoid bacillus, and as inflammation of the gall-bladder is relatively rare, some factor other than the presence of the typhoid bacillus must be necessary to produce cholecystitis.

The typhoid bacillus may remain in the gall-bladder after it has disappeared from the other organs. In two cases I found it in the gall-bladder, while cultures from the heart's blood, spleen, liver, and kidney were negative. Welch[11] and Blachstein, in their experimental studies, found that the typhoid bacillus remained in the gall-bladder of rabbits after it had disappeared from every other organ. In one case it was found one hundred and twenty-eight days after intravenous inoculation. Miller[12] has reported a case of cholecystitis in which the bacillus typhosus was isolated seven years after an attack of enteric fever, and v. Dungern[13] obtained the micro-organism fourteen years, and Droba[14] seventeen years subsequent to the primary infection.

Stagnation of the bile favors bacterial invasion. Netter,[15] Homén,[16] and Miyaki[8] found that after ligating the ductus choledochus the gall-

* Ehret and Stolz[7] during the past year have attempted to prove that the bile of healthy animals, in the majority of cases, is not sterile, but contains bacteria in small numbers. Their work is not convincing, and Miyaki has been unable to confirm their results.

bladder was soon infected. Netter demonstrated that such an infection could occur within twenty-four hours. Recently at the Boston City Hospital an exploratory laparotomy was made in a case of suspected cholecystitis. A nodular mass involving the head of the pancreas was discovered. The gall-bladder and the bile appeared natural; but the bile yielded an abundant growth of the bacillus coli, and this micro-organism was also demonstrable in cover-slips made from the bile. In this instance it is probable that infection followed slight compression of the ductus choledochus by the new growth. Petersen,[17] in his report of the cases of cholelithiasis occurring in Czerny's clinic, says: "The bile which escaped from the fistulous opening was examined from time to time, and it was found that the bacteria diminished very rapidly. The bile often became sterile at the end of eight days, and almost always after three or four weeks." Cushing[18] found in one experiment that typhoid bacilli introduced directly into the gall-bladder of a dog entirely disappeared from the bile in twenty-four hours. These observations seem to show the importance of an unimpeded outflow from the gall-bladder.

Channels of Infection. Bacteria possibly infect the bile in two ways: 1. An ascending infection through the biliary passages from the duodenum. 2. A hæmatogenous infection. Bacteria enter the portal circulation from the diseased portion of the intestine, and are eliminated by the liver and pass into the bile.

In typhoid fever the evidence seems to point to infection through the blood. The typhoid bacillus is nearly always found in pure culture in the gall-bladder. In the eleven positive cases of which I have the full bacteriological notes it was obtained in pure culture in every instance. If infection took place through the biliary passages we should expect to have a mixed infection with the bacillus coli or the streptococcus, as Miyaki has shown that these bacteria, at least in animals, are generally present in the lower end of the ductus choledochus.

Fütterer[19] has demonstrated that micro-organisms which enter the portal vein begin to be excreted by the liver through the biliary channels within a few minutes. It would seem as if the specific bacillus must gain entrance into the circulation in every case of enteric fever, as Neufeld[20] has called attention to the association of the typhoid bacillus with rose spots, and his observations have been confirmed by Curschmann,[21] Rumpf,[22] Scholz and Krause,[23] in Germany, and in America by Richardson[24] and workers in our own laboratory.

Typhoid septicæmia is no longer regarded as an extremely rare condition. Auerbach and Unger[25] have obtained the bacillus typhosus from the blood during life in seven out of ten cases, and Schottmüller[26] in forty out of fifty cases.

We have cultivated the bacillus typhosus at the autopsy from the

heart's blood during the past two years in three out of twelve cases. I obtained the micro-organism in one case from the heart's blood, the spleen, the liver, the kidney, a mesenteric lymph node, the gall-bladder, the urinary bladder, the right middle ear, and the bone-marrow.

If we regard every case of invasion of the gall-bladder by the typhoid bacillus, without symptoms and without pathological changes, as a case of cholecystitis, then, as we have shown, nearly every case of typhoid is a case of cholecystitis. This is confusing and unreasonable. We should limit the term cholecystitis to those cases in which there is clinical or pathological evidence of inflammation of the gall-bladder.

Origin of Gallstones. The theory advanced by Naunyn,[27] in 1891, that gallstones are due to a catarrhal inflammation of the gall-bladder induced by micro-organisms, has been generally adopted. It is supported by experimental and bacteriological evidence. Among recent investigators Chauffard[28] appears as the sole supporter of the old theory of a lithiac diathesis.

According to Cushing,[29] Dr. Welch, in 1890, obtained living colon bacilli from the centres of gallstones, and suggested that they might bear an etiological relation to the formation of biliary concretions.

Fraenkel and Krause,[9] and v. Mieczkowski[30] have shown that the gall-bladder in general disease conditions rarely contains micro-organisms.* Yet in cholelithiasis it is almost always infected. Petersen[17] found bacteria present in the gall-bladder in thirty-six out of forty cases and v. Mieczkowski[30] in eighteen out of twenty-three. In all of the infected cases the bacillus coli was isolated, usually in pure culture. Other observations tend to show that the bacillus coli is the micro-organism most frequently associated with biliary lithiasis.

Dufourt[32] refers to nineteen patients with gallstones whose first attack followed typhoid fever, in twelve cases within six months.

Cushing[29] reviewed the cases of cholecystitis associated with gallstones, operated on at the Johns Hopkins Hospital, and found that ten out of thirty-one gave a previous history of typhoid fever.

Richardson[33] observed large clumps of typhoid bacilli in the bile, suggesting a gigantic Widal reaction in the gall-bladder. He put forward the theory that these clumps of agglutinated bacteria serve as the starting-point for the formation of biliary calculi.

Experimental researches support the view that the typhoid bacillus induces gallstone formation. Gilbert and Fournier[34] produced biliary calculi in animals by the injection into the gall-bladders of attenuated cultures of the typhoid bacillus. Richardson[35] produced a stone about

* The earlier and widely quoted observations of Létienne[31] seemed to show that in disease the bile was usually infected. He found the bile sterile in only eighteen out of forty-two cases examined. Létienne's work is justly criticised by Fraenkel and Krause. His methods were faulty, and his results are not in accord with those of more careful investigators.

7 mm. in diameter by injecting a culture of agglutinated bacilli into the gall-bladder of a rabbit. Cushing[18] was successful in one case in producing small biliary calculi by an intravenous inoculation of the bacillus typhosus.

Mignon[36] believes that the formation of stones ceases with the death of the bacteria. Old stones are sterile.

The cases of cholecystitis caused by the bacillus typhosus can be divided into two classes: 1. Cholecystitis secondary to typhoid enteritis. 2. Cholecystitis due to a primary infection of the gall-bladder. Since Dr. Mason[2] published his report, in 1897, five cases of cholecystitis due to the typhoid bacillus have been studied at the Boston City Hospital. Three of these occurred during typhoid fever.

Case I. *Catarrhal cholecystitis during typhoid fever; death from intestinal hemorrhage; bacillus typhosus in pure culture from the gall-bladder.*—Henry R., aged twenty-eight years (autopsy No. 9973), died May 8, 1899, of intestinal hemorrhage in the fifth week of typhoid fever. There were no symptoms referable to the gall-bladder. At the autopsy the classical intestinal lesions of typhoid fever were found. The bile appeared natural except for the presence of great numbers of minute shreds. Microscopical examination of the bile revealed large masses of desquamated epithelium and great clumps of bacilli morphologically identical with the bacillus typhosus. The appearance of the clumps was similar to that seen in a Widal reaction except that they were much larger.

Bacteriological Examination. A bacillus varying in length, decolorized by Gram's method, no gas production in a Smith fermentation tube containing 1 per cent. glucose bouillon, motile in twenty-four-hour bouillon cultures. The micro-organisms were agglutinated by the blood of a typhoid patient, diluted 1 : 30. Blood was collected at the autopsy, sealed in a glass tube and tested seven days later. It agglutinated the bacillus obtained from the gall-bladder in dilutions of 1 : 100 and 1 : 200; no reaction, 1 : 500. It agglutinated a culture of the stock typhoid bacillus in the same dilutions. Diagnosis: bacillus typhosus.

Case II. *Cholecystitis during typhoid fever; cholecystostomy; bacillus typhosus in pure culture; death.*—Emaria E., aged fifteen years, admitted to Dr. Shattuck's service, September 2, 1899. Three weeks before entrance taken with fever and pain in abdomen. Diarrhœa since onset. Young lad, fairly well developed and nourished. Spleen palpable, abdomen rigid, tympanitic; rose spots over lower chest and upper abdomen. Two days after admission general abdominal tenderness, muscular spasm, slight distention. Pulse rose from 110 to 160; temperature, 104°; leucocytes, 5200; Widal negative. A perforation was suspected.

Operation, by Dr. Munro, September 4th. In peritoneal cavity some light coffee-colored serum; no signs of perforation. As urine drawn during the operation contained bile, an incision was made through the right rectus muscle and the gall-bladder opened. Dark bile and some puriform material escaped. The patient died the following day; no autopsy.

Bacteriological Examination. A cover-slip preparation made at the operation from the contents of the gall-bladder showed medium-sized

bacilli decolorizing by Gram's method. In the cultures a pure growth of this bacillus was obtained. It had the following characteristics: No gas in glucose agar; acidified milk very slowly; did not coagulate milk; no indol produced in four days in glucose-free bouillon; agglutinated by the blood of a typhoid fever patient. Diagnosis: bacillus typhosus.

CASE III. *Suppurative cholecystitis during the third week of typhoid fever; cholecystostomy; small biliary calculi found; bacillus typhosus isolated in pure culture from gallstones and bile; recovery.*—Annie D., aged thirty-six years, admitted to Dr. Shattuck's service October 20, 1899, complaining of headache. Patient's health had always been good; she remembered no previous illness. On October 13th, seven days before admission, seized with severe headache, so took to bed. Chills at onset; diarrhœa; anorexia. She was a well-developed, obese woman. Temperature on admission 102.8°; general abdominal tenderness. Case progressed favorably until October 30th, when there was a sudden onset of severe pain in the epigastrium and the right hypochondrium; no distinct chill, but acknowledged shivering a little; no vomiting; no jaundice. Palpation revealed, about a hand-breadth below the right costal margin, the outlines of an apparently enlarged gall-bladder. The temperature, which had been slowly but steadily falling since admission, shot up to 103.1° that evening; pulse rapid; face flushed. Leucocytes, 13,200. October 31st, patient seen by Dr. Munro, who diagnosed probable suppurative cholecystitis, and advised operation.

Operation, by Dr. Munro. Vertical incision over tumor. Gall-bladder tense, swollen; fresh adhesions bind it to intestines and omentum. Gall-bladder opened; bile and creamy pus escaped, with a number of small gallstones. Patient made a good recovery. Left the hospital December 11th; small granulating wound; no discharge of bile.

Bacteriological Examination. Seven small spherical gallstones 1 to 3 mm. in diameter; surface dark, brownish-gray, crenated. They are friable; centres yellowish. The stones were split with a sterile knife and cultures made from their centres.

A serum culture inoculated with pus from the gall-bladder and agar plates from the nuclei of two gallstones gave pure cultures of the typhoid bacillus. Growths from six different colonies each showed: a bacillus decolorizing by Gram's method; motile in twenty-four-hour bouillon cultures; straw-colored growths on serum; invisible growth on potato; milk not coagulated; no gas in glucose agar; no indol in glucose-free bouillon. Agglutinated by blood of a typhoid patient in fifteen minutes; dilution, 1 : 25; diagnosis: bacillus typhosus.

In this case there can be but little doubt that the typhoid bacillus was the cause of the cholelithiasis. If so, it would seem as if the calculi must have been formed within eighteen days, and it is probable that they were formed in much less time. This is in accord with the view of Naunyn,[37] who believes that biliary concretions can be formed in a very short time. Milian[38] found gallstones which contained the typhoid bacillus in a patient who died on the sixteenth day of typhoid fever, and Hanot[39] in a patient who died near the end of the third week.

CASE IV. *No history of typhoid fever; cholelithiasis; cholecystostomy; bacillus typhosus obtained in pure culture from gall-bladder and from gallstones; death.*—Mary L., aged forty-three years, admitted to Dr. Monk's service, September 27, 1900, complaining of pain in the abdomen. Two similar attacks—one seven, the other six years ago—each lasting about two weeks; never jaundiced; no history of typhoid or other continued fever. Three weeks before admission, while at sea, severe attack of nausea, vomiting, and general malaise; no nose-bleed; no diarrhœa. Condition at this time was thought to be due to sea-sickness. After several days got well of this illness. Four days before admission, onset of severe abdominal pain referred mainly to epigastrium and right hypochondrium. No jaundice, no nausea or vomiting. Several severe chills, moderate fever. Patient was well developed, obese; temperature 100°. No abdominal distention; slight involuntary spasm in right upper quadrant of abdomen; over this area relative dulness and moderate sense of resistance; slight pain on palpation of upper abdomen. Leucocytes, 5000. During next three days temperature showed wide variations; occasional chill.

Operation, by Dr. Monks, September 30th. Incision 12 cm. long in right hypochondrium, parallel to and over outer edge of right rectus. Abdominal wall very thick. Gall-bladder just beneath anterior margin of liver, presenting end 7.5 cm. in diameter, the whole surrounded by many adhesions. The gall-bladder was incised; the wall measured 3 to 4 mm. in thickness; much pus without odor escaped; 218 gallstones removed. The cystic and common bile ducts explored and no gallstones discovered.

The patient failed steadily, and died October 19th. No autopsy.

Bacteriological Examination. A cover-slip preparation from the gall-bladder showed polynuclear leucocytes and a few short bacilli which were decolorized by Gram's method. Culture upon blood serum: Diffuse, moist, white growth of a short bacillus, decolorized by Gram, present in pure culture. It had the following characteristics: distinctly motile; bouillon diffusely clouded; brownish-white elevated colonies on agar-agar and blood serum; invisible growth on potato; litmus milk rendered acid, not coagulated; no indol in glucose-free bouillon. No gas production in 1 per cent. glucose bouillon after five days, terminal reaction of bulb of Smith fermentation tube acid; no gas in 1 per cent. lactose bouillon, reaction alkaline; no gas in 1 per cent. saccharose bouillon, reaction alkaline. Diagnosis: bacillus typhosus.

The gallstones varied in size from 3.5 mm. to 1 cm.; pyramidal shaped; brownish-yellow, mottled; central portion dark-brown, surrounded by grayish-white outer layer marked with radiating striæ. All the calculi similar in color, shape, and consistence. No cultures were made from the calculi at the time of the operation. I did not get possession of them until January 2d. Although they had been kept in a hot, dry room for three months, I made cultures on that day from the centres of ten of the gallstones. Cultures from eight of the stones remained sterile. From the other two—one measuring 6 mm. the other 7 mm. in size—I obtained a meagre but pure growth of a bacillus with the following characteristics: decolorized by Gram; gelatin not liquefied; invisible growth on potato; no indol produced in glucose-free bouillon; milk acidified, not coagulated; no gas produced in 1 per cent. saccharose, in 1 per cent glucose, or in 1 per cent. lactose;

agglutinated by blood of a typhoid patient, dilution 1:100. Culture of our stock typhoid bacillus agglutinated by same blood, dilution 1:100; not agglutinated in a dilution of 1:200. Diagnosis: bacillus typhosus.

The history in this case dates back seven years, so it is probable that the gall-bladder harbored the bacillus typhosus for that length of time. It is interesting to note that the biliary calculi contained living typhoid bacilli three months after their removal from the patient. Another interpretation of the findings is that the patient had a mild attack of typhoid fever a month before admission; that the gall-bladder was secondarily involved, and that the typhoid bacilli penetrated sterile gallstones. The theory that bacteria enter pre-formed pigmented gallstones is not supported by an observation lately made by Dr. Christian at the Boston City Hospital. He obtained an abundant pure growth of the bacillus mucosus capsulatus from a case of suppurative cholecystitis associated with cholelithiasis, but the gallstones were sterile.

CASE V. *No history of typhoid fever; gangrenous cholecystitis and localized peritonitis caused by the bacillus typhosus; cholecystostomy; partial cholecystectomy; recovery.*—Kate B., aged thirty-six years, admitted to Dr. Gavin's service May 16, 1900. No history of typhoid fever. Sixteen days before entrance pain in back, chill, vomiting; took to bed and remained there; bowels regular, pain worse in legs. Three days before admission onset of pain in right hypochondrium; vomiting of greenish material; noticed lump in side three weeks earlier. Patient was well developed and fairly well nourished. Temperature, 102°. Abdomen moderately distended; tumor mass in right upper quadrant; flat on percussion; tender; muscle spasm. Left leg swollen, hard, reddened, from knee to ankle.

Operation, by Dr. Gavin, May 17th. Vertical incision in right hypochondrium. Gall-bladder greatly enlarged and covered with flakes of fibrin. On incising the organ a large amount of greenish-yellow pus escaped. A portion of the wall of the gall-bladder was removed, as it was apparently gangrenous. Temperature fell gradually after the operation. Patient made a good recovery.

Bacteriological Examination. Cover-slip from external surface of gall-bladder showed an occasional polynuclear leucocyte; rather numerous bacilli. Culture on blood serum after twenty-four hours showed a diffuse, grayish-white growth of a medium-sized bacillus decolorizing by Gram. A similar bacillus was obtained in pure culture from the contents of the gall-bladder. Both had the following properties: Actively motile in twenty-four-hour bouillon cultures; milk not coagulated; no indol production; no gas produced in fermentation tubes containing glucose, saccharose, and lactose bouillon. Agglutinated by typhoid blood, dilution 1:10; no reaction, 1:25. Agglutinated by patient's blood, 1:10; no reaction, 1:25. Known typhoid bacillus agglutinated by patient's own blood, 1:10; no reaction, 1:25.

As there were no symptoms or history of typhoid fever in this case, it is probably another instance of primary infection of the gall-bladder

with the bacillus typhosus. In 1898, Cushing[39] reported a case similar to these two, and Mitchell[40] has recently recorded another. Hunner[41] studied a case of cholecystitis in which he considered the bacillus typhosus had been retained within the body since an attack of typhoid eighteen years before. This is possible, but, as Horton-Smith[42] says, the evidence in Hunner's case seems to point to a local infection. If it be included we have, with the two here reported, five cases of primary infection of the gall-bladder with the bacillus typhosus.

I wish to express my indebtedness to the visiting surgeons of the Boston City Hospital for permission to publish the clinical histories of the cases here reported, and to the assistants in the pathological laboratory for aid in the bacteriological work.

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THE OPERATIVE TREATMENT OF PARALYTIC TALIPES OF THE CALCANEUS TYPE.[1]

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Paralytic talipes calcaneus is, as the name implies, that form of talipes characterized by a prominent heel. It is, however, far more important as a disability than as a deformity, for its cause is the loss of the principal lifting and propelling force of the body—the calf muscle. When this muscle is paralyzed the os calcis, deprived of its support,

[1] Read before the American Orthopedic Association, 1901.

sinks downward and assumes by degrees a more or less vertical position, its posterior surface becoming inferior. Thus the distance between the ankle-joint and the bearing surface of the heel is increased. There is not, however, except in advanced cases, persistent dorsal flexion of the foot, as is sometimes seen in the congenital form, because this attitude is opposed by the force of gravity.

The most noticeable of the secondary deformities is the exaggeration of the longitudinal arch. This is caused by the approximation of the anterior and posterior supports of the foot, by the action and retraction of the remaining muscles, and by the adaptive shortening of the other

FIG. 1.

Talipes calcaneus due to paralysis of the calf muscle (gastrocnemius and soleus), illustrating the typical deformity of moderate degree.

tissues. These secondary changes are in great degree the effect of functional use, and are, therefore, most marked when the foot has been used for a long time without adequate mechanical protection. (Fig. 1.)

In cases of this character, with which this paper is chiefly concerned, the patient, to all intents hamstrung, stamps about on his heel very much as one would after a Pirogoff amputation, but with the added disadvantage of the insecurity due to the uncontrolled movement at the ankle-joint. The forefoot serves no function other than to fill the shoe, and in advanced cases it becomes simply an atrophied appendage suspended from the elongated and pad-like heel.

In anterior poliomyelitis the affection, which in all but very exceptional cases is the cause of the deformity under consideration, the paralysis is by no means always limited to the calf muscle; in many instances the adductors or abductors are involved, with consequent lateral distortion. Of this type calcaneo-valgus is the most common and the most important. (Fig. 2.)

If the calf muscle alone is paralyzed, the damage to the spinal cord being limited in area, the growth of the limb is not particularly affected, nor is the circulation greatly impaired. And, although the power of the other muscles of the posterior group is of little value as far as function is concerned, the foot remains far more normal in contour and life-like in appearance than when the paralysis is more extensive. In almost

FIG. 2.

Talipes calcaneo-valgus. In this form the adductors of the foot (tibialis anticus and posticus) as well as the calf muscle are paralyzed.

every instance, however, the growth of the foot is retarded, far more so than when the muscles of the anterior group are paralyzed. This is a striking example of the effect of loss of function on development.

As has been stated, deformity is favored and induced by functional use, and, while it may be admitted that efficient protection would in great degree prevent the secondary and characteristic distortions, yet the general results of mechanical treatment, judged from actual observation, are very unsatisfactory.

The reason is apparent. When the anterior muscles are paralyzed the function of the brace is simply to prevent toe-drop, but when the power of the calf muscle is lost the support must withstand the weight of the body and the strain of locomotion. Under this strain the springs and elastic bands, so often employed with the aim of replacing muscular

action, give way, and even braces of more solid construction bend and break with discouraging frequency.

The expense of apparatus and the constant need of repairs account doubtless for the fact that, in the majority of cases, braces are inefficient, or are worn intermittently, or are discarded altogether; consequently the deformity develops, often to an extreme degree. This is especially true of the cases of calcaneo-valgus because of the difficulty of controlling the lateral deformity and because of the discomfort often caused by the restraining support.

It is in cases of this type that one turns to operative treatment in the hope of palliating the disability, of restoring the symmetry of the foot, or, at least, of making support less burdensome and more effective.

In the consideration of this form of treatment tenotomies, forcible correction and the like, which are undertaken simply to overcome secondary deformity, do not require comment. The other procedures which are at the present time advocated are Willett's operation and its modifications, tendon transplantation, and arthrodesis. These may be considered in order.

Willett's Operation consists essentially in dividing and shortening the tendo Achillis, together with the overlying fascia and skin on the back of the ankle, sufficiently to hold the foot at a right angle with the leg, or, as modified by Gibney, in an attitude of plantar reflexion as extreme as is practicable. The object of this operation is to oppose the resistance of the non-contractile tissues on the back of the leg to the deforming influence of functional use. Further experience has shown that except in those cases in which contractile power remains in the calf muscle the procedure, even from the palliative stand-point, is of little service other than as a means of restoring temporarily the symmetry of the foot. Furthermore, when the foot is inclined toward varus or valgus the operation is contraindicated, as the shortened tissues on the posterior aspect of the limb would tend to exaggerate the lateral deformity.

The operation of sawing off the posterior extremity of the os calcis and displacing it further downward, as suggested by Walsham, is simply another method of shortening the tendo Achillis, which has little to recommend it.

Tendon Transplantation. It is interesting to note that the first operation of tendon transplantation was performed by Nicoladoni for the relief of this deformity, the two lateral peroneii being inserted into the tendo Achillis. Yet this is the condition of all others for which the procedure, from a curative stand-point, is of least value. The calf muscle is nearly double the strength of all the other muscles of the foot combined, and more than ten times as strong as the two muscles which were used to replace it.

It is evident, then, that tendon transplantation finds its proper place as a palliative operation which may be of advantage when one can change a force that distorts the foot to a position in which it may be of service even if slight.

ARTHRODESIS. This operation is performed with the aim of establishing a firm right angular ankylosis at the ankle-joint, thus allowing the patient to dispense with apparatus.

Arthrodesis at the ankle-joint is of little value when lateral distortion is present. In such cases the operation must include the sub-astragaloid and medio-tarsal joints also. In any event arthrodesis is likely to be disappointing if performed in childhood, as growing bone can hardly restrain so marked a tendency toward deformity. If, then, apparatus must be employed in the after-treatment, absolute fixation is undesirable because of the increase of the muscular atrophy that is likely to follow and because a certain elasticity at this joint lessens the strain upon it.

This sketch of the operative treatment presents fairly, I think, the inadequacy of each of the procedures that are recommended for the relief of this affection. Indeed, an analysis of the disability should make this evident without the test of actual experience. As has been stated, the disability of calcaneus depends in very great degree upon the insecurity of the foot. This insecurity, although caused directly by the paralysis, is greatly exaggerated by the fact that the weight must be supported on the astragalus perched upon the displaced os calcis, and the in stability is, of course, increased when there is lateral distortion of the foot.

The most effective remedy, therefore, must be removal of the astragalus. Sufficient mobility is thus gained to allow of a backward displacement of the foot upon the leg, so that the body-weight, instead of falling upon an elongated heel practically in the plane of the flattened calf, is advanced toward the centre of the foot. Thus the adverse leverage which tends toward recurrence of deformity is lessened, and the symmetry of the distorted part in great degree is restored. Incidentally one or all of the procedures that have been described may be indicated as a subsidiary part of the treatment. In fact, the operation that I have usually performed for the relief of calcaneo-valgus might be described as astragalectomy, arthrodesis, tendon shortening, tendon transplantation, and backward displacement of the foot, the first and last of these being by far the most important, in that the chief cause of the insecurity is removed by lowering and carrying forward the articulation between the leg and the foot.

The details of the operation are in brief as follows: A long curved incision is made below the external malleolus from the tendo Achillis behind to the head of the astragalus in front. The two peronei ten-

dons are freed and are either divided or displaced backward; the astragalus is then exposed and its extraction is usually made comparatively easy after the interosseous ligament has been divided by forcibly displacing the foot inward. The cartilage is then removed from the surfaces of all the adjacent bones; the tendo Achillis is shortened if it

FIG. 3.

FIG. 4.

is longer than the new position of the foot will require, and into it are inserted and attached the proximal ends of the tendons of the two peronei muscles, which in cases of calcaneo-valgus usually retain their power—a power that serves no useful purpose, but is simply an agent of deformity. The wound is then closed and the foot is displaced backward so that the internal malleolus is brought into contact with the

scaphoid bone, and a plaster bandage is applied, fixing the foot in an attitude of slight plantar flexion. (Figs. 3, 4, and 5.)

The operation may be most conveniently performed under the Esmarch bandage, the pressure being finally relaxed, so that bleeding points in the skin may be secured. Subsequently the limb is elevated for a time to lessen the oozing from the denuded bones. Drainage is unnecessary. The plaster bandage remains until the parts are firmly healed, the patient being encouraged to use the foot as soon as pressure causes no discomfort, usually in from one to three weeks after the operation. In none of the operations, thirteen in number, that I have performed has there been wound infection, and the only mishap was a superficial sloughing of the skin due to a tight bandage. This, however, in no way interfered with the success of the operation.

FIG. 5.

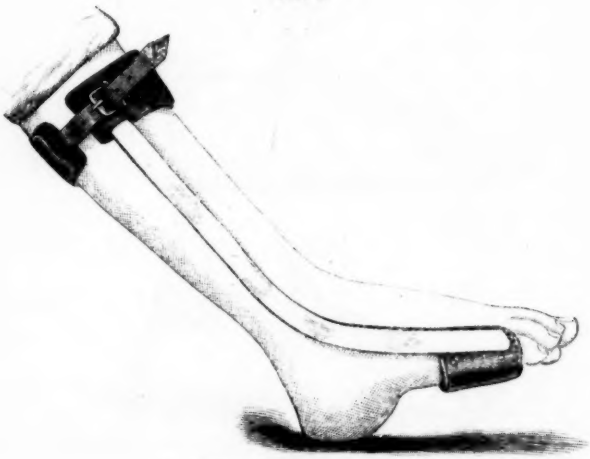
Figs. 3, 4, and 5 illustrate the effect of operative treatment in cases of paralytic talipes calcaneo-valgus.

Although the cartilage is removed from the bones, one must not expect absolute ankylosis, as the apposition of the parts is not sufficiently perfect to assure it. In fact, as has been stated, the limited motion that remains is desirable, especially in those cases in which considerable muscular power remains, as it lessens the direct strain upon the ankle. Apparatus to prevent deformity has been employed in all cases, although the patients can walk without it very well, and it may be that in time it can be discarded.

Recently I have employed a support which seems to be a great improvement over those that I formerly used. A plaster cast of the foot and leg is made with the part in the proper attitude, and on this the brace is modelled. It consists essentially of two light curved steel

bars passing from the middle of the lateral aspect of the upper quarter of the leg downward on either side, in front of or over the malleoli to the metatarso-phalangeal joints. These bars are attached to one another below by a curved foot-plate as wide as the bearing surface of the anterior part of the foot, and above by another steel band of similar width which passes across the front of the leg in the neighborhood of the tubercle of the tibia. This is suitably padded, the circumference at this point being completed by a strap about the calf. An elevation of cork or rubber is placed in the back of the shoe to support the foot in the attitude of slight plantar flexion, corresponding to the cast. A similar thickening of the heel of the shoe, sufficient to induce very slight flexion at the knee, is of advantage also in counteracting the tendency

FIG. 6.



An effective brace for talipes calcaneus.

to recurvation, which is present in certain cases. It also serves to lengthen the limb, which is usually somewhat shorter than its fellow. This brace, which is held firmly in its place by the shoe, is inconspicuous, simple in construction, and much more resistant than the ordinary brace, as the strain upon it is comparatively slight. There is consequently no likelihood of slackened straps, or of distorted uprights, or of broken foot-plates. Its use is, of course, not limited to operative cases; but as this paper is especially concerned with this class I need not consider further details of mechanical treatment, except to call attention to the fact that the gait of the wearer of a wooden leg for an amputation below the knee is far better than in the majority of cases in which the essential muscles that control the foot are paralyzed. The greater,

therefore, the approximation to the security assured by the artificial member, the greater will be the improvement in locomotion. This is a fact not generally recognized in the construction of the ordinary brace.

It is not my purpose to urge operative treatment for all cases of calcaneus, but simply to suggest an effective procedure for those cases in which, for one reason or another, mechanical treatment is inefficient —a class which, in hospital practice at least, is a very large one.

THE DIFFICULTIES IN MAKING A DIAGNOSIS IN THE BONE LESIONS OF NURSLINGS.[1]

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The title of this paper suggested itself to me on account of the paucity of symptoms presented by several cases in babies in my wards during the past year which rendered an early and definite diagnosis most difficult and unsatisfactory. I present it in the hope that the discussion which it may bring forth from my fellow-members, together with observations I myself may make, will add somewhat to our means of making a more definite and an earlier diagnosis.

By nurslings I have meant to convey those babies under two years of age who are either breast-fed or bottle-fed, and in whom dentition has not begun or is only partially completed. However, the limitation need not be made, as many of the symptoms and blood changes to be spoken of occur in young children as well as infants.

On being called to see a baby with one or more of the cardinal symptoms of bone inflammation certain of the following formidable array of diseases may present themselves to the clinician for differentiation and exclusion, viz.: tuberculous osteomyelitis or epiphysitis, syphilitic periostitis and osteochondritis, achondroplasia, rhachitic proliferation, softening or eburnation, scorbutic subperiosteal hemorrhage, or, perhaps, epiphyseal separation, osteosarcoma, epithelioma (?), rheumatism, "growing pains," rheumatoid arthritis, acute anterior poliomyelitis, acute osetomyelitis, acute arthritis, and also influenza, typhoid infection, colon infection, and pneumococcus infections; osteomata, whether exostoses or hyperostoses; osteopsathyrosis, spontaneous fractures, and cysts.

[1] Read before the American Orthopedic Association, 1901.

The following is a case in point, involving a differential diagnosis between tuberculous osteomyelitis, specific osteochondritis, the subperiosteal hemorrhage of scurvy, and sarcoma:

CASE I.—C. C., a boy, aged five months, was put under my care on January 1st of this year. The child seemed in great pain in the right leg, which was held flexed at about 45 degrees, rotated outward, and abducted the same amount. The mother stated that the child had had pain apparently for three months—*i. e.*, from the time he was two months old—and she noticed he had held his leg constantly still and moved the left leg freely, so that she thought the right leg must be paralyzed.

Family History. The parents were refined and well-to-do, apparently healthy people. They had been married ten years before any children were born to them, but any miscarriages were denied. The father had led a rough life on the plains, and had been more or less dissipated. He acknowledged drinking to excess, had had venereal warts, but denied syphilis. He had had no rash, sore-throat, or headache, etc., at the time of the appearance of the venereal warts, and had received no medication for a prolonged time. (Further data on this point was unobtainable.) He is subject to "rheumatic gout." The patient has a brother and sister who are said to have always been strong and well. A paternal uncle died of phthisis, and a maternal uncle had a sinus in the back. The first wife of the patient's father died of consumption eleven months after marriage. Any history of malignant tumor in the family is lacking.

Previous History. The labor was easy and normal, and the child at birth was large and apparently healthy. No definite history of "snuffles" or rash is obtainable; but the baby had, when one month old, a large red, ecchymotic spot on the left cheek, which shortly disappeared. When two months old a swelling appeared at the left wrist, with malposition of the hand, which the mother thinks involved the joint. This was treated by the family physician with pasteboard splints and mercurial ointment, and followed by recovery; but some thickening is still easily detected at the lower left radial epiphysis. The feeding had been combined bottle-feeding and nursing. At the time of admission the child nursed twice daily, and was bottle-fed on equal parts of milk and water, *sterilized*, every three hours.

Pain and night-cries had been present for two months before I saw the patient, and insomnia has been a marked symptom. The maximum temperature, reached a few days before admission, was 103° F., but did not exceed 100° F. after that. As to any history of trauma, the father thought a former nurse was of such a nature that she would have unhesitatingly struck the child or wrenched an arm or a leg in anger, and attributed the child's condition to this; but he had no definite knowledge to this effect.

Condition of child on admission to the hospital, January 8th: On inspection a plump, well-nourished and well-muscled baby, and large for its age, was seen, weighing eighteen pounds two ounces. The lips, mucous membranes, cheeks, and nails were of a good color. The skin everywhere seemed normal, with no scars or discolorations suggestive of ecchymoses or subcutaneous hemorrhages. The gums were normal in appearance, and no teeth showed signs of erupting. The head was of good shape, with fontanelles open, but not protuberant. Chest and

abdomen were normal in shape, and there was no beading of ribs or enlargement of epiphyses except as above stated (viz., left radius). The eye at once noticed the malposition of the right thigh and a distinct, fusiform, diffuse, spindle-shaped swelling at the upper third of the thigh, measuring 10¾ inches (28 cm.) in circumference against 10 inches (25.5 cm.) on the left. This swelling was said to have increased rapidly of late.

On palpation the lymphatic glands were not appreciably indurated anywhere except in the right inguinal region and right iliac fossa. The spleen was palpable, and extended 2 cm. below the costal margin. Percussion also disclosed this Auscultation was negative except for a slight bronchitis involving the larger tubes.

The swelling in the right femur seemed to extend from about the middle third of the thigh to a point near the coxo-femoral articulation, but not into it. It was larger above than below, hard, did not fluctuate, and involved apparently more the anterior and external aspect than the posterior and internal. Muscular spasm was marked, and any movement seemed to cause pain and brought on a crying spell. The other joints did not show this tenderness. One point on the external aspect seemed to be more sensitive than the rest. A radiograph was made, which showed an hour-glass shape in the bone, with straight, regular edges. The blood count gave: Reds, 4,100,000; whites, 18,400; hæmoglobin, 80. The differential count showed lymphocytes increased; no myelocytes or eosinophiles. Beginning poikilocytosis was noted. The diagnosis, so far as the blood was concerned, showed a slight secondary anæmia.

With this data before me I at first thought of two possibilities—scurvy and tuberculous osteomyelitis. For the former I gave modified Pasteurized milk, lemon-juice, and beef-juice; and for the latter employed traction in the line of the deformity of 1¾ to 2½ pounds, which seemed to afford almost immediate relief. On the third or fourth day after the traction was instituted the baby seemed perfectly comfortable, slept all night, appetite became vigorous, and increased weight was shown. I reluctantly gave the child for three successive nights tuberculin from Trudeau's laboratory, the most reliable I could get, with absolutely negative results. I say "reluctantly," because I felt if the result had been positive a bronchial lymph node might be responsible, and not the thigh trouble; and, beside, the usual site for tuberculous invasion—the epiphysis—did not seem the location of the trouble. If negative, we all know tuberculin is not infallible, and a wrong inference might be obtained. The picture was not that of a true tuberculous coxalgia, and the child's age and the rapidly increasing induration was against such a diagnosis. The blood-findings, according to Dana's forty-one published observations,[1] led me to think the high leucocyte count would indicate tuberculous abscess formation; but Brown,[2] after an

[1] Boston Med. and Surg. Journ., May 28, 1896.
[2] Transactions of California Medical Society, 1897.

examination of seventy-two cases, dissents from this conclusion unless there is a secondary infection; "simply increased activity of the tubercular process itself," he claims, "would not give an increased leucocyte count over 2000 to 3000 above normal." Thus my diagnosis of tuberculous osteomyelitis was most unsatisfactory and by no means conclusive.

My diagnosis of scorbutus also lacked many usual symptoms to sustain it. The gums were normal, no subcutaneous hemorrhages had appeared, and there was no anæmia to speak of. The child was well nourished, and the other limbs showed no tenderness. The only possible straws for the scurvy theory to hold to were the possible subperiosteal hemorrhages and the fact that many of the best authorities, such as Starr, Rotch, Lewis Smith, H. L. Taylor, and others, observe that scurvy shows no bleeding gums prior to dentition. Aspiration brought out only a few drops of blood, which was normal in appearance and not black or disintegrated. Thus following the old whist rule, "when in doubt, lead trumps," I ordered mercurial inunctions. After one week of this treatment the leucocytes had fallen to 16,800, but after two weeks the swelling had increased one-half an inch (1.5 cm.), and was appreciably harder, and my diagnosis of congenital syphilis was shaken; however, as the child seemed so much improved in every other way, I persisted in the inunctions. I then called in an eminent consultant, who suggested sarcoma, and advised an exploratory incision, with hip-joint amputation if sarcoma was found; but he felt possibly metastases had already taken place; but if not, and sarcoma should be found, permission should be obtained, in advance of any puncture, to go ahead with the amputation, for fear of metastases from the puncture. The child looked so rosy, bright, and merry that I determined to trust to "the trump" a little longer, with the result that the patient was discharged from the hospital on February 21st, with no induration in the right thigh and a freely movable joint. His general condition was excellent. To my mind it was a clear case of syphilitic osteochondritis. Carl Beck's paper on "Cartilaginous Cysts Near the Epiphysis of Long Bones in Children"[1] had not then appeared, else I should doubtless have added this disease to my difficulties; but he tells us the skiagraph differentiates this condition from osteosarcoma, in that the former gives a translucent appearance at its situation, with straight, sharply marked edges of bone, while sarcoma gives no such translucency and an irregular, external demarcation. Wiegel has called my attention to the mottled or spongy look in his excellent skiagraphs of sarcoma in bone.

Ridlon, in vol. iv. of the *Transactions of the American Orthopedic Association*, speaks of a number of syphilitic bone and joint lesions seen by him, and quotes from Bumstead and Taylor's *Venereal Diseases*

[1] THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES, June, 1901.

(fourth revised edition, p. 735) in support of his diagnosis, which had been questioned by eminent authorities and pronounced tuberculous, although his results with antisyphilitic medication were quite suggestive.

To what extent blood examinations will help us remains to be seen, and with the vast material at our command it would seem to me well to make blood examinations a part of our ward records in bone diseases, just as urine has been heretofore. This seems especially so, in our special work, when one thinks of the important part played by the bone-marrow in the genesis of blood. Such records should bring forth fruit in due season and increase our means of differential diagnosis. In attempting any inferences from the blood-finding in infants we must bear in mind that a normal leucocytosis exists, according to Schiff, Gundobin, Bayer, Hayem, and others, for we may have at birth from 17,000 to 21,000 white cells, and after the first feeding a digestion leucocytosis as high as 36,000. On the tenth day 10,000 to 14,000, and at the sixth month 12,000. After a meal 30,000 leucocytes is never a very high count in infants under two years. Cold baths likewise increase the leucocyte count. It is also to be observed that a backward child's blood is more of the infantile than of the adolescent type.

Cabot gives us an excellent foundation on which to build in *Clinical Examination of the Blood* (third revised edition, 1898), and I will refer to it for certain points on the blood in infancy and childhood:

"1. All signs by which sickness is shown in the blood of adults are exaggerated in children.

"2. All forms of infantile anæmia are apt to be associated with enlarged spleen.

"3. In infantile blood the small mononuclear elements are more numerous than in the adult ('lymphocytosis of infancy').

"4. The red cells show variations in shape and size, and nucleated reds may be found.

"5. The hæmoglobin is relatively high at birth and relatively low during childhood."

It is therefore important to make our observations before meals or a cold bath, to state the child's age, and, if possible, obtain a blood record before the sickness began, to determine how much is physiological and how much pathological.

To apply this practically for diagnostic purposes in tubercular osteitis or periostitis without abscess formation (according to Dana's observations), and without secondary infection (according to Brown's), we have no leucocytosis, while in syphilitic bone disease we have the leucocytosis of a secondary anæmia. The same is true in scurvy and rickets. Acute osteomyelitis can be diagnosticated from so-called "rheumatic pains," "growing pains," and neuralgia by the leucocytosis present.

The average leucocyte count for osteosarcoma in adults (?) is high—about 17,000. Injections of tuberculin produce leucocytosis; therefore blood counts should not be made immediately after such injections. Acute rheumatism gives about 16,000, subacute 9000, and chronic 7000 leucocytes, on an average.

Hereditary syphilis is perhaps the best-known cause of a relative lymphocytosis in children, but scurvy may produce the same result.

In infancy the percentage of eosinophiles is very often higher than in adults, so that in them eosinophilia may be considered physiological; but it is also very characteristic of malignant bone disease and osteomalacia, as found by Neusser and his pupils. Cabot, from whom I have obtained most of the foregoing, mentions having seen eosinophilia in osteomyelitis also. In some cases of syphilis and syphilitic disease of the spinal cord we find eosinophilia.

Myelocytes are found especially in malignant bone disease, hereditary syphilis, and acquired syphilis and other conditions where there is a grave anæmia with leucocytosis.

Normoblasts show more a severe secondary anæmia, and megaloblasts show a *very* severe secondary anæmia in bone disease as elsewhere. Applying this data to the case cited, we find the infant had 18,400 leucocytes and relatively increased lymphocytes, which would suggest exclusion of tuberculous bone disease in favor of syphilis or scurvy. Absence of nucleated reds, myelocytes, and eosinophilia, together with no marked diminution in the red count, would tend to exclude sarcoma from the preponderance of authority, especially as this was not what might be called a small tumor.

Thus, if this reasoning is logical, we would narrow down to syphilis and scurvy, and as the supposed subperiosteal hemorrhage was the only likely symptom of scurvy, hereditary syphilis alone remained.

Certainly, it seems to me, the blood examination was of value as an additional aid in the diagnosis of this case.

I will cite briefly another perplexing case.

Case II.—H. R., aged eighteen months, son of a laborer, was admitted to the Hospital for Crippled Children, April, 1901, with a marked swelling extending from the upper border of the right hypochondriac region to the lower border of the right iliac region, and from the mid-axillary line around the right side of the loin nearly to the spinal column. The duration of this abscess was said to be four weeks; that is, the parents had noticed it for that length of time. In the lumbar region fluctuation was detected, and the pus seemed near the surface. The child was anæmic, emaciated, tubercular looking, and evidently in pain. Large furuncles were present on the occiput and right eyelid. The temperature was 101° F. The spine was rigid and double. Psoas-contraction of some 90 degrees was present, but no kyphosis or other deformity was apparent. Family history was good. The patient had been healthy up to September, 1900, when he had measles and whooping-cough, and had

a traumatic history of having fallen down five or six steps and off a chair previous to the onset of the present trouble, a month ago. His father stated that in the morning the child was apparently well, playing and talking, and in the evening could not use the right leg. Pain had been constant since, with fretful nights, anorexia, thirst, fever, sweats, constipation, but no vomiting. Palpation in right iliac fossa gave no induration in the region of the appendix.

The symptoms and picture were those of Pott's disease, with double psoas-contraction and lumbar abscess, but no kyphosis.

The blood count briefly showed 40,000 leucocytes, a low red count, and low hæmoglobin, increased polymorphonuclear neutrophiles and small mononuclear leucocytes. Quite a number of cells resembling myelocytes and a few normoblasts were also found. This was against tubercular abscess in the extremely high leucocyte count and the presence of marrow cells found, as an incision demonstrated, evacuating 500 c.c. of thick greenish pus, sometimes mixed with blood, from which cultures showed the presence of the staphylococcus pyogenes aureus. The abscess cavity was curetted and drained, and the child showed rapid improvement. The psoas-contraction gradually yielded to traction in the line of the deformity.

THREE NOTEWORTHY CASES OF BRAIN INJURY.[1]

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From the earliest dawn of medical science injuries of the brain—the seat of life and of intellect, if not the soul—have furnished an interesting field for study. The correct explanation of concussion—the mechanism by which laceration and hemorrhage take place without fracture, the laws which govern the direction of the lines of fracture, the prognosis as to life and health and intellect, and the best methods of treatment, are problems which have attracted the attention of surgeons and physicians from the days of Hippocrates, and are still burning questions for consideration by the surgeons of our day.

The dangers in cerebral injuries are shock, hemorrhage causing compression or anæmia, and infection.

The symptoms of shock occur immediately; those of hemorrhage at the same time or a few hours later, occasionally as much as a week later, and those of infection from two days to a week, or even several months or years after an injury, possibly as a result of a second injury which arouses a focus of infection which has long remained dormant.

[1] Read at the meeting of the Association of Military Surgeons of the United States, 1901.

Shock so often co-exists with hemorrhage that in many cases it is impossible to know just how much of the symptoms to attribute to shock and how much to hemorrhage.

The remote effects are abscess, tumor, epilepsy, insanity, and chronic headache.

The work of a brilliant galaxy of neurologists and surgeons, composed of Ferrier, Broca, von Bergmann, Starr, Keen, Victor Horsley, and others, in cerebral localization and operations on the brain during the last quarter of the century just ended, has established surgery of the brain on a firm basis, and has proved that with the exercise of proper judgment, skill, and antiseptic precaution this dangerous region can be invaded with almost the same impunity as that which follows operations on the abdominal viscera—an impunity that is so nearly the rule that the abdominal cavity has been termed the "playground of the surgeon."

The large amount of brain tissue that can be destroyed without producing death and the toleration by the brain of the presence of foreign bodies are remarkable. Two examples of the latter, selected from many reported cases, may be mentioned: Evans reports a case in which a piece of wood, one and a quarter inches long and a third of an inch thick, remained in a man's brain, just above the ethmoid bone, for thirty-two years. Forwood reports the case of a soldier who was in good health five months after having been shot in the forehead, the Mauser bullet, as shown by a radiograph, remaining lodged in the posterior part of the brain about the tentorium cerebelli.

According to my experience, the greatest mortality occurs in injuries which are caused by falling from a height and striking on the head, such as being thrown by a horse, falling from a building or scaffold or a rapidly moving car, or taking a "header" from a bicycle. Such cases are usually accompanied by extensive fracture of the skull, involving both the base and vertex, with numerous lacerations and hemorrhage in the substance of the brain. Of almost equal fatality are gunshot wounds of the brain, while the injuries resulting from blows upon the head by clubs, hammers, hatchets, and stones give the smallest mortality, such cases usually consisting in a limited fracture of the skull, with a corresponding lesion in the brain.

The treatment will naturally depend upon the nature of the injury. Symptoms of compression from hemorrhage, depressed bone, or other foreign body demand operative interference. Gunshot wounds of the brain, unfortunately, in the majority of cases are not benefited by operation. In the few cases in which the patient survives the shock, and the ball can be located by means of the Röntgen ray in an accessible locality, it should be removed in order to prevent the development of abscess, cyst, tumor, or other dangerous sequel.

The following three cases have been selected from my note-book as worthy of being reported:

CASE I. *Severe hemorrhage, with laceration of the brain, without fracture of the skull or rupture of the dura mater.*—K. M., aged eighteen years, white, native of the United States, was admitted to the Emergency Hospital, August 10, 1899, having just been struck on the head with a club and knocked down. On being assisted to his feet he walked a short distance, fell again, and lapsed into complete unconsciousness.

Examination one hour after the injury. Patient profoundly unconscious; breathing deep, sometimes sighing; both pupils dilated and immobile; the pulse 60, and full; clonic contraction at short intervals of the right arm and leg, and sometimes the left arm, with persistent tendency of the face to turn to the left side. A small contused wound of the scalp, not extending to the bone, was observed just above the left ear.

A diagnosis of cerebral hemorrhage was made, and the patient was immediately prepared for operation. No anæsthetic was necessary. A large flap of scalp was turned down on the left side of the head, but a careful examination failed to detect any fracture of the skull. By means of a trephine and bone forceps a section of the skull 10 cm. in diameter was removed over the fissure of Rolando, when the dura mater was disclosed, bulging, tense, without pulsation, laceration, or rupture. On incising the dura a large black clot of blood, about the size of an orange, popped out. A freely bleeding artery on the surface of the brain was ligated and the finger was gently passed around the opening beneath the dura, but no further clots were discovered. There was no pulsation in the portion of the brain exposed. A grooved dilator was passed into the left lateral ventricle, but nothing was discovered.

The only change caused by the operation was contraction of the pupils and a diminution in the frequency of the convulsions, and the patient died about two hours later without becoming conscious. The necropsy revealed numerous small hemorrhages throughout both hemispheres.

This case affords an excellent clinical illustration of the elasticity of the skull in permitting such an extensive injury to the brain without fracture of the skull or rupture of the dura mater, as shown by Felizet's well-known experiment of filling the skull with paraffin, then dropping it on the floor from a height, when it is found that the paraffin is flattened or indented at the point of impact without fracture of the skull.

CASE II. *Compound fracture of the frontal and nasal bone, with depression of almost the entire frontal bone.*—E. M., aged twenty years, native of the United States, white, female, typewriter, was admitted to the Emergency Hospital, July 21, 1899.

History. The patient had been injured in a collision between two "roller coasters" by being struck in the face by some object the nature of which was not certainly known, but it was thought to have been the back of another person's head. Unconsciousness resulted, but only lasted for a short time, and on admission to the hospital the patient was perfectly conscious, the nose was bleeding freely, and she occasionally vomited black blood, which she had probably swallowed. Both eyes were closed by the swelling. The upper part of the nose and almost the entire frontal bone were depressed to the depth of from 1 to 2 cm.

The patient was prepared for operation by shaving and disinfecting the scalp, and the operation was performed about three hours after the injury. An incision was made from one temple to the other across the top of the head through the edge of the hair, just behind or above the line of depression, and the anterior flap reflected forward. The line of fracture was then seen to extend from the nasal bones through the left supra-orbital ridge, upward and outward, and then across through the frontal bone about 2½ cm. anterior to the coronal suture to the opposite side of the head; then downward and forward to the right temporal fossa, just behind the external angular process of the frontal bone. Two other lines of fracture extended from the principal one—one on either side—in a direction backward through the remainder of the frontal and into the parietal bones to an unknown distance. The parietal bones were freely movable, but were not displaced. That portion of the frontal bone included in the line of fracture was depressed and overlapped by the surrounding bone, the depression being most marked at the superior border. The depressed bone was elevated by means of a lever passed down to the nasal eminence between the skull and dura mater; the edges of the fractured bones were carefully adjusted, the scalp united with silkworm-gut sutures without drainage, and a dressing applied. The first dressing was made on the tenth day after the operation, when primary union was found to have taken place, and the stitches were removed. There was some bleeding from the posterior nares for the first three or four days, but the patient recovered without incident, and left the hospital at the end of two weeks.

At this time, one year and ten months after the injury, the patient's condition is as follows:

She is able to attend to her work, but has occasional spells—once in two or three months—of a highly nervous character, with mental depression, excitability, headache, and insomnia, lasting from two or three days to a week—possibly the premonitory symptoms of epilepsy or insanity. The physical deformity is not very great; the nose is somewhat broadened at the base, and the left frontal eminence is a little less prominent than the right; there is a slight internal squint of the left eye, and the patient has lost the sense of smell, evidently from injury to the olfactory nerves from fracture of the ethmoid bone or inflammatory thickening of the dura mater. A remarkable feature of this case was the extensive fracture of the skull, including both the base and vault, but especially the latter, with comparatively little damage to the brain.

CASE III. *Compound fracture of the skull, with loss of brain; recovery.*—E. H., negro, aged thirty-eight years, native of Virginia, laborer, was admitted to the Emergency Hospital, February 6, 1901.

History. The patient had just been struck on the head by a portion of a rapidly revolving wheel which had broken. He was not unconscious, but in a dazed condition, and apparently unable to talk or to understand what was said to him. He had lost considerable blood, and was suffering from shock, so 500 c.c. of normal salt solution were injected into the left median basilic vein. A wound involving both scalp and skull extended 15 cm. from a point 2½ cm. above and the same distance in front of the right ear backward and upward to a point 11 cm. above the external occipital protuberance. Blood clots and brain tissue protruded along the entire wound. There was conjugate devia-

tion of the eyes toward the side of the injury, and partial paralysis of the left side of the face and the left upper and lower extremities.

After shaving and disinfecting the head the operation was begun without an anæsthetic, but as the patient was restless, turning his head from side to side, chloroform was given. The blood clots and brain tissue projecting, and seven fragments of bone buried in the brain, were removed and a branch of the middle meningeal artery ligated. The opening in the skull was shaped like a dumb-bell, the anterior extremity —about 4 cm. in diameter—being the larger. The dura mater was so much lacerated as to render the use of sutures impossible, and as the brain continued to project through the skull, it was kept in place by packing over two square metres of gauze into the cavity of the skull. The scalp was then united by sutures, leaving three openings through which the ends of the gauze projected, so that it could be removed at the proper time.

February 7th. The patient is doing fairly well, but decidedly apathetic and indifferent to his surroundings. Right conjugate deviation of the eyes still marked. No evidence of pain on pricking the left arm and leg, and only slight on pricking the face. He was able to move the left arm and leg, but rather weakly, the arm being weaker than the leg.

9th. The gauze packing is renewed. A rough test shows the existence of left homonymous hemianopsia.

18th. The conjugate deviation has about disappeared, the patient being able to turn his eyes in any direction. His mind is clear, but he seems to cerebrate slowly. Hernia cerebri occurred in each of the openings left for removing gauze, and was controlled by packing as in the beginning, changing the dressing once in two or three days.

27th. Three weeks after the injury the patient was permitted to get up. He was able to walk by holding to objects and dragging the left leg. He complains of a sensation of pins and needles in the left arm and leg.

March 9th. Thirty-one days after the injury the fungus cerebri has all disappeared, and the surface of the brain has sunk to a distance of at least $2\frac{1}{2}$ cm. below the surface of the skull. The left arm and leg are much stronger, and the patient is able to walk about without holding to objects. The eyes were examined by Dr. Swann Burnett, who confirmed the diagnosis of left homonymous hemianopsia. The test for Wernicke's symptom was not made.

When last examined, April 27th, the wounds were entirely healed, and the patient walked without limping. The left hand is almost as strong as the right, but he has difficulty in approximating the thumb to the tips of the fingers, so that fine movements, such as buttoning his clothing, are impossible. This is from absence or dulness of the tactile sense, as he can approximate them by an effort while looking at them, but is unable to do so unless he sees them. The mouth is drawn slightly to the right side. Left homonymous hemianopsia is still well-marked, and there is also partial deafness of the left ear. The sense of smell seems to be normal.

In this case the patient lost at least two ounces of brain. As mapped out on the skull, the wound in the brain must have extended from a point just below the division of the fissure of Sylvius into its two branches, backward and upward, crossing the lower extremity of the fissure of Rolando, and gradually diverging from it posteriorly as it

approached the median line of the skull, involving the first temporo-sphenoidal convolution, which would account for the partial deafness, the supramarginal and angular convolutions, and possibly the cuneus hence the homonymous hemianopsia.

The conjugate deviation of the eyes is not easily explained if it is assumed that this phenomenon depends on injury to the second frontal convolution, as the wound was situated some distance behind and below this convolution. The third frontal convolution might have been involved in the lesion, so it seems fair in this case to attribute the conjugate deviation to injury of this convolution.

The loss of tactile sensation in the left hand, and to a less degree in the foot, was to be expected from injury to the posterior motor area. According to Starr, "the parts susceptible of the finest and most delicate movements, those directed by the most acute sensations—the lips, the fingers, and the toes—lie furthest back in the motor area, chiefly in the posterior central convolution. Lesions in this convolution almost always cause some loss of tactile sensation as well as paralysis."

As the patient was right-handed and the injury was on the right side there were no symptoms of aphasia—no interference with memory of any kind—as there would undoubtedly have been had the same lesion occurred on the left side.

TUBERCULOSIS OF THE PORTIO VAGINALIS AND CERVIX UTERI; ITS PATHOLOGY, DIAGNOSIS, AND TREATMENT.[1]

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Tuberculosis of the female genital organs has been known to the medical profession for many years. Raymond, a French writer, and others, described lesions of these organs as early as 1831. Such studies, and those during more than fifty years following, were simply discoveries of far advanced lesions in subjects dying of phthisis or more or less general tuberculosis. They were of interest only to the pathologist. It was then believed, as was asserted by Lebert and Rokitansky, that the diagnosis of genital tuberculosis in the living female was not possible. The first publication worthy of notice which considered the disease in this part of the body from a clinical stand-point, fully warranting the contradiction of the above statement, was the monograph of Hegar (1886), entitled *Die Entstehung, Diagnose und chirurgische Behandlung der Genital tuberkulose des Weibes.* This work distinctly marks an epoch of advance in our knowledge of the early pathology, diagnosis, and treat-

[1] Read before the Thirteenth International Congress of Medicine, Paris.

ment of genital tuberculosis, and it has formed a groundwork for more accurate and extensive practical studies during the succeeding years. The collaboration of the literature and personal studies of tuberculosis of the Fallopian tubes, ovaries, and vagina are now frequently in evidence, and it may be said that at present their pathology and clinical significance is as well appreciated as that of tuberculosis in any other part of the body.

Tuberculosis of the portio vaginalis and cervix uteri, however, have not met with the same degree of consideration, though clinically at least of equal importance. Tubercular infection here is of very rare occurrence, but it has seemed to the writer that the pathology, symptomatology, and treatment of a sufficient number of cases have now been carefully described to afford deductions which are of practical value.

My studies in this direction, of which I can here offer only a short résumé of conclusions, was instigated by the clinical observation and pathological studies of one instance of the disease, followed by a careful survey of thirty two post-mortem, twenty-two clinical, and fifteen clinical and post-mortem observations taken from the literature.

The case coming under my notice was admitted to the University Hospital on March 27, 1899. The patient was an American white woman, aged twenty-three years. Her previous personal and family history was good and free from tuberculosis. Her husband was healthy. She was married in October, 1898, but was never pregnant. Menstruation appeared at eighteen years of age, but was very slight in amount, and occurred only every two, three, or five months. She had not menstruated since marriage. Leucorrhœa, profuse and extremely offensive, had been present for three years. There was a slight discharge of blood on two occasions after sexual intercourse. Since puberty, unconnected with the menstrual period, she had experienced every month or two mild attacks of aching pain in the left inguinal region, which seemed to be induced by exercise. She believed her present illness to date from nineteen years of age, and since then she had gradually failed in health. Two weeks before coming under observation she was taken with severe pain in the left side of the abdomen, backache, frontal headache, and pain in the lower extremities, had fever and a rapid pulse, was much exhausted, and compelled to go to bed. After a few days' treatment for la grippe she was better and able to be out of bed, but, because of continued pain in the left side and the presence of a profuse and offensive mucopurulent vaginal discharge, her physician suspected uterine and ovarian disease, and accordingly made a vaginal examination. He found the vaginal cervix hard and indurated and the seat of a growth which bled easily to touch. Considering these local symptoms highly suspicious of carcinoma of the cervix, he transferred the patient to my care.

On admission to the hospital the patient still complained of considerable pain in the left inguinal region, sacral backache, frontal headache, loss of strength, and general malaise. A careful study of the urine determined it to be microscopically and chemically normal.

VAGINAL EXAMINATION. The vaginal outlet and vagina were nulliparous and normal. The vaginal cervix was irregular in shape and very much hypertrophied, being nearly twice the normal size. The mucous membrane of the portio vaginalis for a distance of from 1 cm. to 2 cm. surrounding the external os was eroded and of a bright rose-red color. The whole surface of the cervix was hardened, indurated, and bled easily to touch, and in some respects resembled in appearance the beginning cauliflower-like epithelioma of the portio vaginalis. On making a closer examination the cervical canal was found dilated, admitting the tip of the index finger. The finger detected an irregular, papillary growth, the size of a hickory-nut, arising from the posterior wall of the cervical canal just within and without the external os. It grew from rather a broad surface, perhaps 1.5 cm. in diameter, filled and dilated the cervical canal, and protruded on to the vaginal surface of the posterior lip.

This growth was of the same character as the less extensive disease spoken of as erosion, which extended from the cervical canal and surrounded the external os in other directions. There were no ulcers or necrotic changes demonstrable to the naked eye. The disease was strictly limited to the cervical canal and portio vaginalis in a manner very similar to papillary erosion in the nulliparous cervix. The papillæ were small, finger-like projections attached to a distinctly indurated underlying cervical tissue. They were not friable, but were elastic to touch. Although the whole cervix was hard and indurated, it was not as resisting as that in any form of carcinoma. The bleeding caused by palpation was slight and resembled that sometimes seen in the papillary erosion of laceration of the cervix. The uterus was retroverted to the second degree, slightly movable, and very small in size. The left ovary was found prolapsed and adherent behind the uterus. There were no nodules to be felt along the course of the tube, although it was distinctly determined to be hardened and diseased. The right tube and ovary were also strongly adherent and diseased, and were demonstrable in immediate relation with the lateral wall of the uterus.

From the above history and the appearance and structure of the diseased cervix the lesions were considered to be due to one of three rare diseases—tuberculosis of the cervix, malignant adenoma of the cervix, or syphilis of the cervix.

Because of the age of the patient, the history of amenorrhœa in a nulliparous woman, the fact that the growth grew from the mucous membrane of the cervical canal and not from the portio vaginalis, with

the absence of any tendency to friability and with the presence of a half-elastic feeling to the diseased tissue, we were at once thoroughly convinced that the disease was not the cauliflower-like epithelioma of the portio vaginalis, nor did it in any way resemble the other forms of carcinoma of this portion of the uterus.

Since there was no history of syphilis to be gained from the patient or her husband, nor local skin indication of this disease, and knowing the history of amenorrhœa and other symptoms antedating marriage would at least be more likely to be caused by tubercular disease, syphilis was almost wholly excluded.

The long-continued absence of the menstrual flow, with the presence of strongly adherent tubes and ovaries and a small uterus, were points against the diagnosis of malignant adenoma of the cervix, yet we were by no means convinced that this disease was not present, for the growth originated in the cervical mucous membrane.

The history of only fairly good health during a long period, amenorhœa with complete absence of the menstrual flow for six months, the presence of a papillary growth from the cervical canal in a young, nulliparous woman, associated with a small uterus and demonstrably very chronic tubal disease, surrounded with dense adhesions, without history of origin, with also the satisfactory exclusion of the other diseases named, caused me to put down in the hospital record the probable diagnosis of tuberculosis of the cervix, retroversion of the uterus, and tuberculosis of the adnexa. Following our customary plan, however, a portion of the papillary tissue was excised and examined microscopically. This examination positively determined the disease to be the papillary form of tuberculosis, the specimen containing the characteristic miliary tubercles and Langhans' giant cells.

The operation of thorough curettement, high amputation of the cervix, and bilateral salpingo-oöphorectomy was performed on March 29, 1899. The permission for a more radical operation could not be gained from the patient.

The convalescence was normal, and at the time of writing, sixteen months after operation, she had gained many pounds in weight, and no new symptoms had developed. A physical examination of the chest and abdomen determined nothing abnormal, there were no indications of remaining tubercular disease, and the patient was apparently perfectly healthy.

Macroscopic Examination. The portion of the vaginal cervix removed by amputation presented a cut muscle surface, a smooth vaginal mucous membrane surface, and a surface covered with erosion or small papillary outgrowths. The papillary growth began about 1 cm. within the cervical canal, and extended out on the portio vaginalis as already described. It was most extensive and best developed on the

posterior cervical wall and posterior lip of the portio vaginalis, forming here a nodule the size of a small hickory-nut. The nodular growth was directly continuous with similar but less developed growths surrounding the cervical canal and external os. They were flat papillary growths, an excessive papillary erosion, composed of minute finger-like projections, rose-red in color, elastic yet firm in consistency, and showing no indication of degenerative changes. The Fallopian tubes were those of a chronic endosalpingitis. The ovaries were macroscopically normal.

Microscopic Examination. Microscopic sections were cut longitudinally, parallel with the direction of the cervical canal upon all sides, extending the length of the cervix amputated. In all of these sections the squamous epithelium of the portio vaginalis showed an inflammatory change, beginning by proliferation 1.5 cm. from the external os and progressing in some places to complete destruction at the external os. The cells were first distinctly outlined, then became a homogeneous mass, which gradually disappeared. Beneath the squamous epithelium there was generally distributed an extensive small round-celled infiltration, with many leucocytes, which to some extent infiltrated the squamous epithelium layer. The papillæ spoken of as growing from the cervical canal beyond the external os were slender finger-like processes growing close together, covered with columnar and cuboidal epithelial cells. The stroma was infiltrated with small round cells, polymorphous leucocytes, and here and there a miliary tubercle, often containing a typical Langhans giant cell. The underlying endometrium and a considerable portion of the new cell tissue showed the same character of changes. No degenerative change was found in any section, but considerable fibrous change was always present, rather indicating a beginning chronic fibroid tuberculosis.

A microscopic examination of the corporeal endometrium and Fallopian tubes determined the same character and stage of tubercular disease. Sections from the cervix, corporeal endometrium, and Fallopian tubes were stained for tubercle bacilli, and in each a few bacilli were found after several had been prepared.

The primary seat of infection was not determinable, but it is probable this case was one of descending tuberculosis.

Diagnosis. Chronic diffuse tuberculosis of the portio vaginalis, endometrium, and muscle tissue of the cervix (tubercular papillary hyperplastic endocervicitis), tuberculosis of the corporeal endometrium and Fallopian tubes.

From a study of the literature, as before said, I have been able to collect sixty-eight—adding my own, sixty-nine—cases of tubercular infection of the uterus below the internal os; thirty of these were post-mortem discoveries, associated with far advanced tubercular lesions in other

parts of the genital tract and distant parts of the body; two were post-mortem discoveries of primary tuberculosis of the cervix (Friedlander and Kaufmann); twenty-two were clinical observations alone—of these three were associated with lesions in other parts of the genital tract and distant parts of the body; four with lesions in distant parts of the body alone; six with lesions in other parts of the genital tract alone; and in nine the disease was localized to the cervix alone, or it is not stated as to whether other parts were infected. Fifteen cases were observed both clinically and post-mortem, all of which were associated with tuberculosis in other parts of the body.

The age of the patients was recorded in fifty-seven cases as follows: From seventeen to twenty years, 6; twenty-one to thirty, 27; thirty-one to forty, 9; forty-one to fifty, 5; fifty-one to sixty, 5; sixty-one to seventy, 3; seventy-one to seventy-nine, 3, showing very distinctly that the disease is most frequent during the period of sexual activity. There seems to be no relation between the character of tuberculosis and the age of the patient.

The disease was localized to the portio vaginalis in nineteen cases and to the cervical canal in six cases. In the remaining forty-four cases both the portio vaginalis and cervical canal were infected.

The clinical character of the disease is to be distinctly divided into three varieties: tubercular ulceration of the cervix, tubercular papillary hyperplastic endocervicitis, and miliary tuberculosis of the cervix.

Ulcerative Form. This variety appeared as single, large, or as multiple minute (size of a linseed) ulcers distributed over the portio vaginalis or cervical canal, or as an ulcerative process quite completely excavating the entire cervical canal and destroying the portio vaginalis. The ulcerative process commonly surrounded the external os, extending along the cervical canal and over the portio vaginalis. In other cases an ulcer was seen on the portio vaginalis, surrounded by normal mucous membrane. The ground of the ulcers was usually white to yellowish in color. When of any size they were excavated, with sharp edges. The cervix was often hypertrophied. Microscopically a necrotic surface was seen, beneath which were all of the usual tissue changes of chronic diffuse tuberculosis. This tubercular change was in the early cases localized to the mucous membrane and the immediate underlying muscle tissue of the cervix, but in the far advanced cases the muscle tissue was destroyed to extensive excavation, even to almost complete destruction of all cervical tissue. Bacilli were sought for and found in the tissue in sixteen cases, in the vaginal discharge in one case. In two instances they were diligently sought for, but could not be found.

Tubercular Papillary Hyperplastic Endocervicitis. This form of tuberculosis involved the cervical endometrium, particularly the lower

half of the endometrium, and extended out onto the portio vaginalis, as does the common papillary erosion. Such erosion, however, is excessively hyperplastic, and quite frequently forms a tumor, which in one instance reached the size of an apple (Emanuel). The cervix was always hypertrophied and usually irregular in shape. It was indurated, but elastic. The growth was composed of small, finger-like projections, rose-red in color. Rarely, slight indications of caseation were seen.

The microscopic pathology of some of the cases described shows there is much evidence that in the beginning the disease is here a tubercular catarrhal endocervicitis, extending to the gland structure, often causing excessive hypertrophy and hyperplasia of the gland cells, even to a change into epithelioid cells and miliary tubercles. At other times the gland cells were little changed, and the tubercular process was most pronounced in the stroma tissue. The stroma tissue was always more or less involved. The microscopical character was, except in two instances, a chronic diffuse tuberculosis. In these two cases it was a beginning chronic fibroid tuberculosis. From the various descriptions, and with the careful study of my own case, it would seem to me that, aside from the presence of tubercular tissue, the macroscopic character of this variety strongly resembles the papillary erosion of Ruge and Veit, with excessive hyperplasia of all structures, giving the macroscopic appearance of papillary or even small cauliflower-like outgrowths. It is not a vegetative or papillomatous growth, as described by Cornil, Vitrac, Fränkel, and others, but, in the sense of Ruge and Veit, an excessive papillary erosion caused by the infection of the tubercle bacillus.

Tubercle bacilli have been found in the tissue in eight of the fourteen cases reported. Bacilli were diligently sought for by Zweifel and Michaelis, but not found.

Miliary Tuberculosis of the Cervix. Two cases of this variety have been reported (Virchow and Rigal-Cornil). They are characterized by the presence of minute miliary tubercles scattered over the portio vaginalis, associated with extensive and advanced tuberculosis on other parts of the body.

The large majority of the cases of tuberculosis of the cervix thus far described have been secondary infections, there being only three positive instances where it was satisfactorily proved that no other organ or tissue was involved. (I refer to the cases of Friedlander, Kaufmann, and Michaelis.) Cases of possible primary infection of the cervix, with secondary infection of other parts of the genital tract or body, are those of Emanuel, Meyer, Zweigbaum, Derville, Vitrac, and Bouffe.

Symptomatology. The subjective symptoms of tuberculosis of the cervix are indefinite and in no way characteristic of the disease. In

most instances the symptoms have been referable to lesions in the uterus, tubes, or peritoneum. The patients were mostly well-nourished and in good physical condition. Rarely they were anæmic and had failed in health. Many complained of malaise, indefinite and irregular pains in the lower abdomen, a feeling of weight in the pelvis, and more or less sacral backache.

The most frequent symptom in those cases carefully observed has been an abnormally profuse purulent leucorrhœa, now and then tinged with blood. Leucorrhœa was a symptom in twenty-four of the thirty-seven cases observed clinically.

Menorrhagia was present in thirteen cases. In four of these the uterus was much enlarged; one contained a fibroid tumor, and in two retroversion of the uterus was present.

Amenorrhœa was present in twelve cases. In five of these the uterus was abnormally small and in one greatly enlarged.

In three cases where the menstruation was normal the uterus was of normal size.

It would seem that to a great extent menorrhagia and amenorrhagia in tuberculosis of the cervix were dependent upon the presence of hyperplasia and aplasia of the uterus or independent disease of the uterus.

The objective symptoms depend upon the form of the tubercular lesion, the appearance varying as described in the consideration of their pathology.

The two varieties of clinical importance are the tubercular papillary hyperplastic endocervicitis and the ulcerative form. The disease of the cervix in these cases, perhaps, at first sight resembles either the cauliflower epithelioma or the excavating crater-like carcinoma of the cervix; but taking my own experience in the first variety, and accepting the description of other authors in the second variety, I would very positively say that there are many distinct characteristics of difference between carcinoma and tuberculosis of the cervix. However, since the experience of any one observer of this disease has been narrow, I am unable to absolutely contradict the statement of Péan and others who have described such cases as having all of the objective symptoms of carcinoma; yet I believe, if a careful examination of the cervix is made by an experienced clinician, these diseases can generally be separated one from the other.

The papillary form of tuberculosis of the cervix bleeds to touch, but not so early or to the same extent as carcinoma of the cervix. The bleeding may be compared to that sometimes seen in papillary erosion of the lacerated cervix. The tissue in tuberculosis of the cervix is not easily broken or friable, but has an elastic, velvety feeling, which is never present in carcinoma. Induration is present, but it is not the

hard, resisting induration of adenocarcinoma. On the other hand, the tissue is more resisting than that of epithelioma of the portio vaginalis. In most cases of the papillary variety the tissue of the portio vaginalis is lobulated, the vaginal cervix irregular in shape, and the papillary tissue usually fills and extends from the cervical canal. The ulcerative form is a more or less extensive necrosis, an ulcer or ulcers, with sharp, well-defined edges covered with caseous tissue. Here, too, the tissue has an elastic feeling. The friability of carcinomatous tissue is absent, and the induration differs distinctly from carcinoma. The history, age of patient, and duration of disease are important factors of diagnosis.

The tubercular papillary hyperplastic endocervicitis resembles in appearance and structure excessive non-tubercular papillary erosion of the cervix, and the presence of such an erosion with early bleeding —particularly where there is a history of tuberculosis—should be the cause for suspicion of tuberculosis and indicate microscopic examination before treatment is considered. The tubercular papillary erosion also resembles in appearance and structure the rare cases of malignant adenoma of the cervix.

Further, this form in many respects resembles the syphilitic condyloma of the cervix.

The ulcerative form resembles syphilitic chancre, chancroid ulcus rodens, or carcinoma of the cervix. The method of differential diagnosis in the first two instances will be apparent; in the latter instances by the objective symptoms and a microscopic examination.

As in early carcinoma of the cervix, a diagnosis of tuberculosis of the cervix must always be that of suspicion, made positive by microscopic examination of excised tissue. This was the method of diagnosis in ten of the cases referred to.

The clinical diagnosis in fifty-six of the cases reported in the literature was as follows: Carcinoma or suspected carcinoma, 14; sarcoma, 1; ulcer of cervix, 4; ulcus rodens, 1; vegetative growth of cervix, 1; indefinite disease of the cervix, 2; phthisis or tubercular peritonitis, 28; tubercular meningitis, 1; apoplexy, 1; abdominal tumor, 2; caries of spine, 1.

TREATMENT. The treatment of tuberculosis of the cervix must be to a very great extent identical with that of tuberculosis of the Fallopian tubes, ovaries, and uterine body—as a rule, operative. In those cases where there are extensive tubercular lesions in other parts of the body, or where the genital tuberculosis is only a minor cause of the patient's ill health, no treatment aside from local application or cauterization of the cervix is indicated. If there exists a latent tuberculosis in another part of the body which cannot be influenced to acute re-development by the necessary operative measures, and the lesions of the genitals are the chief cause of the patient's illness, then the treatment should be radical

operation—panhysterectomy. Should there be tuberculosis of the Fallopian tubes, ovaries, or uterus, with tuberculosis of the cervix, again panhysterectomy should be the operation of election, though, as in my own case, amputation of the cervix, curettement, and bilateral salpingo-oöphorectomy has as well effected a cure. Tuberculosis localized to the cervix and corporeal endometrium is best treated by panhysterectomy, but curettement and amputation have effected a cure. Primary isolated tuberculosis of the cervix is to be treated in a similar manner, but panhysterectomy is less imperative. Local application and cauterization are at best only palliative, and should be condemned except in those cases where there is advanced tubercular disease in other parts of the body.

Fifteen of the cases referred to in this paper were treated by surgical means: Ten by panhysterectomy; one by curettement, amputation of the cervix, and bilateral salpingo-oöphorectomy; and four by amputation of the cervix. Local applications were applied in eleven cases.

Where the operation was panhysterectomy, seven completely recovered; six are doing well after five and a half years; one after four months. Three died: one of shock following operation, one of phthisis, one of tubercular peritonitis. Where amputation of the cervix was the operation, two recovered and remained well, and two died of phthisis. In the case where bilateral salpingo-oöphorectomy, curettement, and amputation of the cervix were performed the patient was healthy, apparently free from tuberculosis, sixteen months after operation. Where local application, cauterization, was the treatment, one is said to have recovered, five were temporarily improved, and in five the disease progressed.

I am indebted to Dr. H. L. Williams for the preparation of the microscopic sections and much assistance in their study. A complete report of this study of tuberculosis of the portio vaginalis and cervix uteri will appear at a later date.

REMARKS ON THE DIAGNOSIS OF SOME FORMS OF OPHTHALMOPLEGIA.

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I desire to correct some errors in the rules laid down by certain authors which are supposed to guide us in locating lesions affecting the ocular muscles governed by the third nerve, more particularly those lesions involving the nucleus of the third nerve and those involving the root fibres of this nerve in the tegmentum of the crus cerebri.

The internal and external muscles of the eyeball, together with the levator palpebræ, are governed by the third, fourth, and sixth cranial nerves, which have their origin upon the floor of the fourth ventricle and the aqueduct of Sylvius. The course of these nerves to their exit at the base of the brain is markedly different, and, therefore, in considering tegmental lesions, we have to deal more particularly with the third nerve whose root fibres penetrate this body to reach its exit at the sulcus oculomotorius.

Gudden[1] was the first to point out by his experiments on rabbits that there was a crossing of the root fibres of the third nerve at its nucleus, and later Perlia[2] demonstrated that a similar condition existed in man.

These views have been substantiated and described by Kolliker,[3] Edinger,[4] Manakow,[5] Bechterew,[6] and more recently by Bach.[7]

It is now conceded by most authors that there is a decussation of some of the fibres of the third nerve, and, indeed, that this decussation takes place above the posterior longitudinal bundle and is confined to the posterior part of the nucleus. Duval and Laborde,[8] however, are still of the belief that the decussating fibres are component parts of the posterior longitudinal bundle.

Some authors have attempted to subdivide each nucleus of the third nerve into various groups of cells, attributing to each one of them the function of governing a single muscle. These classifications have been made principally by physiologists and clinicians, and are not substantiated by the careful anatomical researches made by Kolliker, Bach, and others, who believe that such sharp divisions are not justifiable.

Among the first to attempt to locate the nuclei governing the various functions of this nerve were Hensen and Volckers.[9] Their experiments consisted in irritating electrically various parts of the nucleus in dogs, and thus eliciting muscular contraction. Later Kahler and Pick[10] devised an arrangement of these nuclei, basing their conclusions on two cases of hemorrhagic lesions in the tegmentum. Some years later Starr[11] constructed a table slightly modifying the one of Kahler and Pick. This table was formulated by deductions made from some twenty cases, many of which were without autopsy.

There is still another scheme by Kneis[12] which is arranged in accordance with the function of the third nerve. He believes that all the muscles innervated by this nerve, excepting the inferior oblique, have their nuclear origin on the same side of the brain and that the latter crosses to the other side. Hence "the motor oculi nucleus of each side contains the nuclei of those muscles which take part in the movement of the eyes toward the opposite side—*i. e.*, the internal, superior, and inferior recti of the same eye, and the inferior oblique of the opposite eye."

In support of the Kneis theory the following statement is made by Hansell and Reber:[13] "Wishart[14] states that when the image of the

affected eye is straight and that of the sound eye tilted nuclear lesions of the same side as the palsied eye may be diagnosed, because as the fibres of the third nerve diverge to the nucleus a few of them pass through the raphe and cross over to the nucleolus for the inferior oblique in the opposite nucleus, and the inferior oblique of the affected eye thus escapes involvement while the inferior oblique of the sound eye is palsied."

As this case of Wishart would verify the Kneis theory, I shall take the liberty of reviewing the same.

Mrs. B., a strong and healthy looking white woman, thirty years of age, was first seen at the clinic at the Eye and Ear Hospital, August 11, 1897. She stated that on July 21st last she had an attack of vertigo, of moderate severity, which passed off completely in the course of a day or two, and one week later she noticed drooping of the lid of her left eye. She said that she had always been in good health, had never had a miscarriage, and positively denied any specific taint.

Examination. In the right eye the pupil measures 3 mm. in diameter, and reacts promptly to light and accommodation. Vision 20/xx, with plus 3 sph. 20/xx. With correction (plus 3 D.) reads Jaeger No. 1, 8—21 ins. In the left eye the pupil measures a little over 6 mm. in diameter, and fails to contract to light or accommodation. Vision 20/cc, with plus 3 sph. 20/xx nearly. In this eye (the left) there is complete paralysis of accommodation, complete ptosis, divergent strabismus, and loss of movement in all directions except outward. There is secondary deviation of the right eye outward. Crossed diplopia, the image of the left eye being higher than its fellow and upright, the upper extremity of the image of the right eye being inclined to the right. The lateral distance between the images increases as the test object is carried to the right. If the test object is moved upward the difference in height and the inclination of the image of the right eye increase.

The loss of movement inward, upward, and downward of the left eye indicates paralysis of the internal, superior, and inferior recti, while the preservation of outward movement and the upright character of the image shows that the external rectus, superior and inferior obliques are not affected. There is no apparent limitation of movement in the right eye, but the upper extremity of the image seen by this eye is inclined to the right. In paralysis of an inferior oblique muscle the upper extremity of the false image is inclined toward the affected side—*i. e.*, in paralysis of the right inferior oblique the upper extremity of the image in the right eye is inclined to the right side.

There is, then, in this case paralysis of all the muscles in the left eye supplied by the third nerve except the inferior oblique, and in the right eye paralysis of the inferior oblique alone—*i. e.*, paralysis of one complete set of muscles supplied by the third nerve, but distributed in a particular way between the two eyes.

Therefore, to Starr's* conclusion, that " if all the muscles of the eyeball supplied by the third nerve are affected, including the iris, the case is one of total peripheral paralysis of the third nerve, and the lesion lies

* M. Allen Starr. Journal of Nervous and Mental Disease, May, 1888.

on the base of the brain," I would add the following, " but if all the muscles of one eye supplied by the third nerve are affected, except the inferior oblique, with paralysis of the inferior oblique alone of the opposite eye, the case is one of total unilateral nuclear paralysis of the third nerve, and the lesion lies on the same side as the eye in which the inferior oblique is not affected and on the opposite side to the eye in which the inferior oblique is alone affected."

In considering the above case it would be logical to conclude that if there had been a paralysis of the right inferior oblique, which is an elevator, the right eye would have been lower than the left one, for in the left eye one depressor and one elevator is said to have been paralyzed, so this eye suffers no vertical displacement. Therefore, the image of the left eye would have been lower and not higher than the image of the right eye as stated, for it is a cardinal law that the higher eye always projects the lower image. Further, the statement made that " in a paralysis of the inferior oblique muscle the upper extremity of the false image is inclined toward the affected side," is very true; but this is of diagnostic value only when the position of the image of the other eye is considered, for a paralysis of the inferior rectus could also cause a tilting of the image toward the affected side, and, indeed, with a vertical displacement similar to that described in the above case. This, however, could not have been the condition here, because the distance between the images would not have increased when the test object was moved upward.

According to the laws of physiology as applied to the paralyses of the ocular muscles, it is very evident that but one form of paralysis could have caused the double images as described in the case under consideration. When fixing with the paralyzed eye in the examination for double images, a paralysis of the third nerve seemed to be indicated, because the excesssve impulse which was sent from the inferior oblique of the paralyzed eye, caused a secondary rotary displacement of the normal eye.

This secondary rotation of the normal eye could have been brought about by an excessive contraction of its superior rectus, which would simulate a paralysis of the inferior oblique of the same eye—that is, if the position of the other eye were not considered.

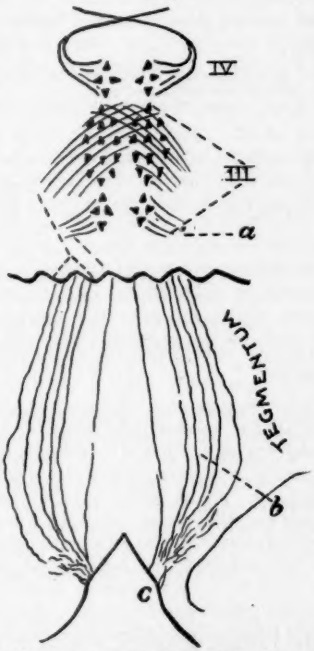
In short, it may be said that our knowledge of the decussating of the root fibres of the motor ocular thus far derived from clinical and anatomical study is of diagnostic value only in consequence of the fact that it increases the tendency to binocular paralysis in nuclear lesions, but that this decussating causes characteristic combinations has not as yet been demonstrated.

Probably the most common and certainly the most characteristic form of nuclear paralysis is that in which some or all of the external

ocular muscles of both eyes are affected (the sphincters of the irides and ciliary muscles escaping).

If all the external muscles of both eyes are affected and the internal muscles are active, the condition is known as total binocular external ophthalmoplegia. Swanzy[15] considers a total external monocular ophthalmoplegia as one of the forms of nuclear palsy. He also states that a nuclear palsy may be monocular and involve all the branches of

FIG. 1.



Schematic drawing of the nucleus of the third and fourth nerves and the root fibres of the third nerve in the tegmentum of the crus cerebri.

IV. Fourth nerve nucleus. *III.* Third nerve nucleus. *a.* Division of the third nerve nucleus for the internal ocular muscles. *b.* Root fibres of the third nerve. *c.* Exit of the third nerve.

the third nerve—the fourth and sixth escaping. These views are by no means confined to the above author, for most of the authors that express themselves on the subject are of a like opinion.

If the anatomy of the nucleus of the motor oculi as described by Kolliker and Bach be accepted, this form of paralysis would be impossible. The decussating fibres as described by these distinguished authors do not pass directly downward from their cell origin, but, first, in an

arched course pass between the cells of the opposite side, to descend here as the most lateral of the root fibres. Thus a lesion situated in the distal part of the nucleus of the motor oculi of one side would of necessity implicate these intermingling fibres which have crossed over from the opposite side. Further, it can be said that in no case has an autopsy demonstrated that a nuclear lesion can involve all or even the majority of the muscles of one eye governed by the third nerve without affecting the muscles of the other eye, while, on the other hand, time and time again have cases which according to the text-books would be most characteristic of nuclear paralysis been found to be due to lesions on the base of the brain.

Moreover, I would say that the diagnosis of nuclear palsy must be made with reserve in all cases of even partial monocular ophthalmoplegia.

The muscles of the motor oculi most likely to be affected in a case of monocular ophthalmoplegia are the internal ocular and the levator palpebræ muscles. The paralysis of these muscles, however—that is, the conditions known as mydriasis and ptosis—are of little diagnostic value in determining either the nature or seat of a lesion in intracranial disease.

Another case from which deductions have been made in locating lesions affecting the ocular muscles is the well-known case of Allen Starr,[16] of partial external ophthalmoplegia of both eyes due to embolism in the tegmentum.

S. D., a Frenchman, aged fifty-six years, a painter by occupation, and a resident of Providence R. I., was brought to my clinic April 18, 1887. He had been a healthy man all his life, with the exception of occasional attacks of rheumatism and frequent attacks of migraine. He had never contracted syphilis, and denied all symptoms of pulmonary, cardiac, gastro-intestinal, and renal disease, although a physical examination revealed the existence of slight aortic obstruction producing a systolic murmur heard at the base and associated with slight ventricular hypertrophy.

He stated that about April 1, 1887, he had been seized very suddenly with double vision and vertigo, objects appearing to move up and down constantly, so that he was much bewildered and unable to stand or to walk alone. He managed with help to reach his home, but has no recollection of what occurred during the three following days, during which, according to the statement of his family, he lay in a somnolent condition, but not comatose or paralyzed. He was then able to get up, but felt stupid, dizzy, and walked with difficulty, it being impossible for him to fix any object with his eyes, all objects being seen double and in motion. These symptoms have improved slightly, but he still feels weak, has vertigo and double vision. He has never had headache, nor has he felt any sensation of numbness or cold or pain in his body, and he has had no paralysis, tremor, or spasm.

Examination shows a well-nourished, intelligent, active man, whose facial expression is rendered peculiar by the position of his eyes. When at rest they diverge slightly, and the right eye is turned upward, and

the right pupil is slightly larger than the left. When the eyes are moved it becomes apparent that the motion is defective. The eyes can be turned from side to side together perfectly, but such motion soon produces lateral nystagmus of the right eye. They cannot be converged to an object nearer than two feet, because of slight weakness of the right internal rectus muscle. They cannot be turned downward below the horizontal line either together or when tested separately. When asked to look up the right eye follows the object above the horizontal line, but the left eye does not. Both eyes, however, turn up and in, though this motion produces rotary nystagmus. The reaction of the pupils to light and in accommodation is prompt, though the right pupil contracts in accommodation more slowly and less completely than the other, and remains slightly larger. Tests by secondary deviation and double images confirm the conclusion reached by this examination, viz., that in the right eye there is paralysis of the inferior rectus and paresis of the internal rectus, and that in the left eye there is paralysis of the inferior rectus and superior rectus. There is no ptosis. There is no paralysis of the oblique muscles or of the external recti. One week later the paresis of the right internal rectus, the difficulty in convergence, and the difference in the size of the pupils had disappeared, but all the other conditions remained, and they have persisted until the present time (April, 1888). He is still suffering from general weakness, vertigo, and double vision, although the latter symptom no longer troubles him excepting when he attempts to draw lines in painting, when he finds that he does not draw accurately, and hence has had to give up his work. He often staggers in walking, but this is due to vertigo and not to ataxia, and it is not constant. He walks as well with eyes closed as with them open. Attempts to turn the eyes up or down, or upward or inward, produce nystagmus of a rotary kind, more marked in the right eye, and this always makes him dizzy. He has developed no further symptoms, is not paralyzed, has equal and normal tendon reflexes, and has no loss of sensation, vision, or hearing. The diagnosis made is embolism, from the aortic valve, in the small arteries entering the posterior perforated space between the crura cerebri, and resulting in one or more small foci of softening in the tegmentum cruris.

This diagnosis can be reached by exclusion, for it is impossible for the symptoms to have been caused by a tumor or a meningitis upon the base of the brain in the course of the third nerves. Such a lesion would not have come suddenly or have remained stationary, and would have involved the nerve as a whole, impairing all its functions and not affecting merely a part. Nor have we here a condition of acute inflammation with hemorrhage in the floor of the aqueduct of Sylvius,* nor such a condition as occurs in a true ophthalmoplegia externa, for there is no tendency manifest toward an extension of the symptoms, or to complete immobility of the eyes.

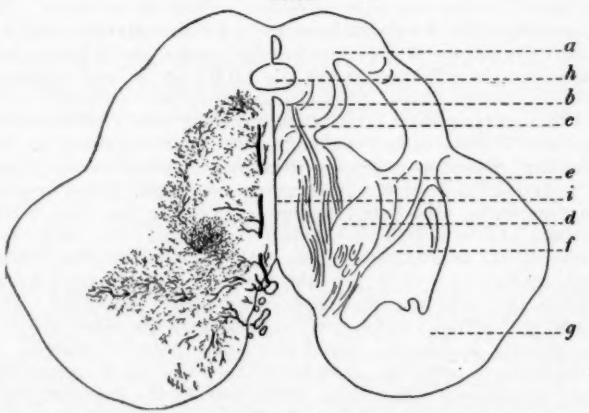
It is true that a hemorrhage in the same region is with difficulty distinguished from an embolism, but in hemorrhage some evidence of pressure upon the adjacent sensory or motor tracts is usually shown by unilateral symptoms which have been wanting here, and here there is a roughened aortic valve to give rise to an embolus. The nature of the lesion is, therefore, easily determined.

* Polioencephalitis of Wernicke.

In diagnosing a tegmental lesion involving the muscles of both eyes there must be assurance that an artery exists which has its distribution in the root fibres of both motor oculi. The question is, Does such a vessel exist?

The conclusion arrived at by Shimamura[17] in his experiments would certainly indicate that no such vessel could be found. The accompanying illustration, taken from Shimamura, shows the isolated blood-supply of the root fibres of each motor oculi, arrived at by injecting colored fluid into the vessels which leave the posterior cerebral artery just to the right of the bifurcation of the basilar artery. This author says the injected median vessel area has about the form of a triangle with its base directed toward the crusta, its apex toward the aqueduct of

FIG. 2.



Section through the crus cerebri and the anterior corpora quadrigemina. (After SHIMAMURA.)

a. Nucleus corporis quadrigemini. *b*. Regio nuclei nervi oculomotorii. *c*. Fasciculus longitudinalis post. *d*. Nucleus ruber. *e*. Lemniscus. *f*. Substantia nigra Sömmeringii. *g*. Crus cerebri. *h*. Aquæductus Sylvii. *i*. Median bloodvessels.

Sylvius—that is to say, the ventrical plane is broadened and becomes smaller as it approaches the aqueduct of Sylvius. Whether anastomosis exists between the vessels of one and the other side could not be demonstrated with indubitable certainty.

The demonstration that, in spite of the ligation of all the vessels of one side and injecting through the vessels of the other side, single vessels of the same side as that of the ligated vessels were still found injected, could indicate that an anastomosis existed between the two median regions; but the fact that in no specimen was there a single anastomosis of this nature to be seen makes it probable that in the depth of the trigonum intercrural very fine communicating branches of vessels exist

between the one and the other side, and that through these fine connecting vessels injected fluid from the median vessels of one side makes its way into the vessels of the other side, but in the crus cerebri itself no anastomosis exists between the two vascular regions, for if so it certainly would have been seen in some one of the many specimens, which, however, was never the case.

Undoubtedly though it was also shown here, and indeed with particular clearness, that a vascular communication could not be demonstrated between the median and lateral areas on the one hand and between the dorsal area on the other hand, therefore the vessels situated along the median line represent an independent and isolated blood-supply.

Hence the fact that the root fibres of the third nerve in the tegmentum of the crus cerebri, as well as the bloodvessels in this region, are confined to their respective sides, make the monocular paralysis characteristic of lesions in the tegmentum.

Therefore, in regard to the case just related, of binocular ophthalmoplegia, in which the diagnosis was made of one or more foci of softening in the tegmentum, I would say that a single focus of softening resulting from an embolus in one of the small arteries in this region could not affect the fibres of both motor oculi in the manner described. Two foci of softening, one on either side of the median line, resulting from the plugging of two distinct arteries, could cause this form of paralysis, still one would be scarcely justified in considering a case in formulating rules which required a diagnosis so broad as one or more foci of softening.

The fact that the muscles of both eyes were affected, together with the absence of hemiplegia or hemianæsthesia, would, I think, make it far more probable that the lesion was in the nucleus of the third nerve.

Therefore, I would modify the conclusion of Starr in which he says: "If one or two of the muscles of the eyeball supplied by the third nerve are affected, others escaping, the lesion lies in the tegmentum of the crus cerebri between the nuclei of origin and the point of exit of the third nerve, one eye or both may be affected; but both eyes are rarely affected in the same manner." He makes one exception to the above conclusions, and that is in the case of a post-diphtheritic ocular paralysis.

I would say in a case of monocular ophthalmoplegia with a sudden onset affecting any of the muscles which move the eyeball supplied by this third nerve, others escaping, the lesion lies in the tegmentum of the crus cerebri.

In a case of binocular paralysis of this form with a sudden onset the lesion lies in the nucleus of the third nerve on the floor of the aqueduct of Sylvius.

These rules are also applicable to a very great extent in cases with a chronic onset. However, lesions on the base of the brain or in the orbit implicating some of the fibres of the third nerve may in rare instances cause similar forms of paralysis. This is especially the case in syphilitic disease of the base of the brain, where gummatous exudations may involve but a part of the fibres of one or even both motor oculi.

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A CONSIDERATION OF CERTAIN DETAILS IN THE MANAGEMENT OF THE PREGNANT AND PUERPERAL PATIENT.

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THE following paper is presented in the hope that the plan of treatment as outlined may be found acceptable by the general practitioner, who is really the accoucheur of the world.

It is an unfortunate fact that among the laity the idea is so prevalent that pregnancy and delivery are simply physiological states and acts. That they are such in many cases is most fortunately true, but this does not make it the less true that the realm of pathology may easily be invaded. Still more unfortunate is it that in the profession are still to be found many men who view the pregnant woman and even the woman in labor with less solicitude than the ordinary breeder views his animals. Some may very likely deny this last statement, but I ask, How many men are accustomed to make a routine examination of the pelvis or of the urine during pregnancy? In how many cases is the heart regularly

examined? How often is the position of the child determined before the actual onset of labor? It might well be asked, How often is this last point ever determined?

Now, while it has been fortunately ordained that women will, in the majority of cases, deliver themselves spontaneously, it is not the less true that in many cases art can assist nature not only in lessening the duration of suffering, but saving the woman possible serious injury if the above questions, with others, have been answered correctly.

With the idea that the need of more careful study of the seemingly normal case should be emphasized, this paper has been prepared. It will be noted that the attempt is not made to present a complete account of the technique of delivery, only such points being discussed as have seemed to me to be the ones most often neglected.

First of all, it is earnestly to be desired that more attention be paid to the period of gestation, and that as soon as possible after the diagnosis of pregnancy has been made the urine should be examined for the presence of albumin and sugar, and that the heart and lungs should also be examined. With regard to the urine, it is the custom of many men to attach great importance to the estimation of urea under a mistaken idea of its importance. This substance is so greatly influenced by dietary changes that its estimation is, in the usual case, of very doubtful value. The importance of the re-examination of the urine at regular intervals during the pregnancy must also be urged. The peculiar hazard which a case of pregnancy runs if there be cardiac or pulmonary complications needs only to be remembered to show the importance of the routine examination of these organs.

General advice should also be given to the patient regarding diet, exercise, and personal hygiene. The diet should be nourishing and simple, and if the appetite be ravenous it should be restrained; while if, as sometimes happens, the reverse is true, it should be stimulated and nutrition kept up by milk or concentrated foods. The daily bath may, of course, be taken, though it is well to caution against the cold plunge. The question of exercise is the one upon which the opinion of the doctor is most frequently desired. It may be said that the more severe forms should be avoided, such, for instance, as the bicycle, horseback riding, sea-bathing, etc.; but, on the other hand, care should be taken to combat the unfortunate tendency exhibited by some women to forego all exercise during the latter months because of mistaken ideas of modesty.

The natural constipation of the pregnant woman should be combated by the use of the milder laxatives, such as cascara sagrada or the pill of aloin, belladonna, and strychnine. The use of salts and castor oil had better be interdicted.

About two months before the expected date of confinement an estimation of the size of the pelvic inlet should be made. This, a bugbear to

many, is in reality an exceedingly simple procedure, only requiring a small amount of practice to enable anyone to gain sufficient experience for all practical purposes. It is well to remember, however, that the method in all its details, as laid down in text-books, while valuable for statistical purposes and perfectly possible in hospital practice, will often in private be found impossible of execution by those whose experience has not been sufficiently great, as, unless one is more or less expert, an unpleasant degree of exposure is essential to the gaining of any reliable data.

The complete determination of the pelvic diameters is, moreover, of little importance in the usual case, as if the inlet be found to be serviceable, the pelvis, as a whole, may be so regarded. The estimation of the inlet is, on the other hand, of the greatest import both as an aid to prognosis and proper treatment. Its estimation is simplicity itself. It will be remembered that the antero-posterior diameter of the inlet of the pelvis extends between the promontory of the sacrum and the posterior surface of the symphysis pubis, the point on the symphysis where this imaginary line impinges being just below its upper border. As any direct estimation of the distance between these two points is impossible, because of the height of the symphysis, it is necessary that some indirect method of estimation be employed. By the study of many pelves it was found that by measuring the length of the diagonal conjugate (the imaginary line between the under edge of the symphysis pubis and the upper edge of the promontory), and subtracting from it a determined factor, which would represent the height and angle of the symphysis, a result could be obtained which would be sufficient for all practical purposes. In order to obtain this diagonal conjugate, the woman, with all constricting clothing removed, is brought to the side of the bed or table, lying in the modified lithotomy position, and the index and middle fingers of the hand are carried into the vagina in an upward and backward direction until the promontory of the sacrum is felt. Its most prominent point having been selected, the point upon which the under edge of the symphysis impinges is marked on the index finger, and the distance between the end of the middle finger and the point just determined is measured. This gives the dimension of the diagonal, from which the true conjugate is to be deduced by computation—that is, by subtracting the factor 2 cm., which will cover the excess of the diagonal over the true conjugate in the majority of cases. It is to be remembered that this excess is occasioned by the fact that the surfaces of the symphysis and sacrum are not parallel, and also that the symphysis measures vertically about 4 cm. on the average. While the promontory of the sacrum can be reached in every case, provided the pelvis is not oversized, it will be found that in normal pelves the attempt will often occasion the woman considerable pain, due to the pressure exerted on the buttocks by the ring and little fingers.

By having previously determined the point on the index finger corresponding to a distance of 12½ cm. from the end of the middle finger it can at once be determined what relation the pelvis under examination bears to the normal without recourse to a pelvimeter. By having this point on the index finger definitely remembered there will be no need to give the normal case the pain spoken of above, as it will at once be seen that the edge of the symphysis approaches very closely to the point on the index finger previously determined without, perhaps, feeling the promontory at all. It must be remembered, however, that there is one caution to be exercised, namely, that the direction in which the fingers are introduced must be upward as well as backward, as, if this precaution is disregarded, it may easily happen that the distance between the symphysis and the hollow of the sacrum will be estimated—a distance which, of course, bears no relation to the inlet. To avoid such an error it is well to always feel for the ileopectineal lines, and by their convergence of direction determine the position of the promontory. If this be done, and the hand is introduced into the vagina until the edge of the symphysis approximates to the determined point on the index finger, the pelvis may be safely looked upon as normal, even though the actual bony prominence of the sacral promontory be not felt.

The next important duty after the estimation of the pelvis is to determine the position of the child. If it be found that it is presenting by the breech, or that a hand or footling presentation is present, it is well to do an external version, attempting the maintenance of this corrected position by the use of pads and a binder. Unfortunately, however, this change of posture cannot be, as a rule, preserved for any length of time, and so the real value of this determination of fœtal posture is that the patient may be impressed with the importance of notifying the physician as soon as the first labor pains are felt, in order that any interference may be practised at the proper time.

Within the definition of "normal cases" may be properly considered women whose pelves on examination are found to be a little less than normal, and also those cases of labor in which there is a retardation of the head in the cavity of the pelvis.

Considering the first of these questions—that of the slight pelvic contractions—it is found that of late years there has been a too frequent tendency to resort to the induction of premature labor to meet the indication presented by this slight abnormality. The excuse given was that at least no harm could result, and that it was better to ensure an easier labor to the mother rather than, by allowing her to go to term, to be compelled to resort to the forceps for the delivery. Any considerable number of cases will, however, show a certain percentage of infantile mortality, not to speak of the decided possibility of the occurrence of maternal mortality or morbidity from septic infection. While simply a repetition of well-

known facts, it is interesting to note a few results bearing on this point as obtained at the Maternity Hospital. In this institution the patients are required to enter the house at least three weeks before labor, in order to minimize as far as possible the chance-error in the estimated date of confinement, and also to gain control of the case, with the idea of establishing an improved personal hygiene. Entirely aside from these important considerations, adherence to this rule has emphasized the following facts as derived from a study of statistics: First, it is found that the children of women who have been in the institution for a period of three weeks or more weigh at birth 20 grammes more, on an average, than do those children whose mothers have either been received in labor or who have entered but a day or two before its onset. Second, it has also been found that among the twenty-one deaths which have occurred among the infants delivered during the last seven years there were seventeen whose mothers had been in the house on an average but two days. These two facts speak strongly of the important part which the last month of pregnancy plays in the welfare of the child, and should be remembered by those more enthusiastic advocates of premature labor who would advise this operative procedure as a means to meet the slight forms of pelvic deformity.

That the induction of premature labor is a therapeutic measure, whose efficacy cannot be overestimated in the properly selected case, is a fact that no one will question; but, as has been said, there is no doubt that its aid is invoked quite often without there being any real indication for it. The opinion of the writer is that it is best, at least in the case of a primipara, in the presence of slight pelvic contractions, to be very cautious in advising that premature labor be induced; and, all things considered, to look forward in the majority of cases to a more difficult labor at term rather than to jeopardize the welfare of the child in order to ensure an easier labor for the mother. This, of course, does not refer to the cases of pelvic deformity of such a grade that there is well-founded fear that a major operation will be necessary if the case be allowed to go to term, but, as has been said, to the smaller degrees of deformity—such, for instance, as presented by the simple flat pelvis with a diagonal conjugate of 10 cm. It is hardly necessary to state that these restrictions in the induction of premature labor have no bearing on the advisability of the termination of a pregnancy in which the onset of labor has been deferred for a considerable period. In hospital work, however, this indication for the induction of labor can but rarely be met, as the histories of the patients are so often so very vague that no dependence can be placed upon them.

Regarding the use of forceps in the type of case mentioned above—namely, that of a head retarded in the pelvic cavity—it may be said that while there is no question that their use simply as a convenience

to the doctor is reprehensible and to be strenuously condemned, it is, on the other hand, true that their province is not as narrow as some hold—*i. e.*, simply to deliver a head after nature has confessed her inability to deliver spontaneously; but that in cases in which the head is retarded in the pelvic cavity, with commencing vaginal œdema, their use is demanded by the best interests of the case, even though there is no doubt that ultimately delivery would be effected by nature unaided. In such a case their province is to save the mother from the continuance of non-effectual pains and also to minimize the dangers from septic absorption, which in the presence of vaginal œdema are greatly increased. It may also be said that the timely use of forceps will, instead of causing pelvic floor lacerations, subserve the opposite end—that of prevention. It is necessary to be very definite, lest the idea be given that, in the writer's opinion, there is frequent need for the application of forceps in the normal case. Such is by no means his view, but it is nevertheless true that much suffering can be avoided by the proper use of these instruments, both through prevention of the long continuance of useless suffering and also by avoidance of prolonged pressure on the pelvic structures, which tends to the production of the very condition which the opponents of the forceps declare is caused by their application—namely, pelvic lacerations.

In the preparation of the patient for labor there are certain procedures which, if observed, will render her much more comfortable than would otherwise be the case, beside minimizing the dangers of subsequent infection and the difficulties encountered by those in charge of the delivery. The most important among these is the full tub-bath, the patient being cautioned to pay particular attention to the external genitalia by scrubbing the area covered by the pubic hair most carefully with soap and water. She should also take a soap-and-water enema, in order to avoid the soiling of the perineum by fecal matter during labor, with the attendant danger of infection of any tears that may occur, and also to prevent retardation of the birth by impaction of feces. The shaving of the pubes, while the custom in many maternity hospitals and in such institutions a procedure of great value, would be strenuously objected to among the better class of patients, and among such it is unnecessary.

The comfort of the patient and physician will also be enhanced if the ordinary clothing be removed by the middle of the first stage, the night-dress and stockings being substituted, with the addition of a wrapper or skirt as long as the patient is on her feet.

The most important phase of this whole subject, however, is, as all will agree, the consideration of the best means of conducting a labor under aseptic precautions. That the consideration of this subject is not, as some might suppose, an exhausted field, will be realized if the

current medical literature be consulted. Indeed, a most remarkable amount of uncertainty will be disclosed as to the best methods of applying the principles of the aseptic technique to the processes of parturition and the puerperium. In the institution with which the writer is connected the results obtained are most satisfactory in this respect, there having been since the foundation of the house a septic mortality of but eleven cases among a series of 2633 confinements, while since the year 1889 there has been no death from sepsis. In this last period there have been 1324 deliveries. Such a record is certainly proof that the method by which it was maintained is worth the consideration of men doing this class of work. It is particularly to be remembered that this is the record of a hospital, and as such is especially good, as in the series of cases there were many emergency births in which no attempt could possibly be made to prepare the patient in any but the most hurried manner.

During the last few years there has been an attempt on the part of some men to shift the blame attached to a septic case by attempting to explain its occurrence on the ground of an auto-infection. That this is a specious attempt is shown by the rarity of the true case of infection, which can scientifically be referred for its causation to previously existent septic foci in the body. Fehling[1] has recently called attention to the folly of considering cases of retention of placental fragments or gonorrhœa as true cases of auto-infection, and states that in his experience such cases as can truthfully be looked upon as instances of auto-infection are very rare, and that in the vast majority of infections the cause will be found in a failure of some portion of the technique. This is the foundation upon which all successful work in obstetrics must be based, and if it is thoroughly grasped will result in the development of the aseptic conscience. This, then, is the main fact to be remembered—that sepsis occurring in a case of labor always places the attendants on trial until their innocence can be proved. As a result of a firm belief in this proposition, there are certain results which follow with reference to the method of treatment of the woman during the period of delivery and also during the puerperium. The preparation of the patient has already been described, and it only remains to emphasize one thing more, namely—that believing that all sepsis, speaking generally, is derived from without, all interference with the genital tract before labor by the use of douches or by frequent examinations is prejudicial to the case. With regard to the inadvisability of frequent examinations, it has been clearly shown that morbidity at least bears a direct proportion to the number made. With respect to the use of the douche, it is to be remembered that not only is the danger present that infection

[1] Münchener med. Wochenschrift, November 27, 1900.

may result directly from the introduction of a douche nozzle, but that a much greater evil arises in all cases in which its use is countenanced by the destruction of those normal bacilli of the vagina whose province it is to act as phagocytes, and thus to guard against the invasion by any chance infection from without. Moreover, there is no reason in the normal case to wash out the vagina, as there are no germs of a virulent nature resident within it; while if there be a pathological condition present the douche alone will not be sufficient to remove the offending germs. To meet this indication, which is most frequently supplied by a gonorrhœa, it is necessary to scrub out the vagina thoroughly with green soap before using the douche. The same is true of the douche after labor, except that its routine use is more dangerous at this time even than when used before the birth of the child. It seems hardly necessary to emphasize the necessity of the greatest care regarding the boiling of all water which is used about the patient, or that the bed-clothing should be as nearly surgically clean as possible. In hospitals the "as possible" must be omitted, and an absolute degree of sterility be insisted on, as not only is such surgical cleanliness perfectly possible, but the dangers of infection are much greater in institutions than in private work, no matter what unsanitary conditions are present in the home of the private case. Realizing the great importance of the matter, the Maternity Hospital enforces the most careful supervision over the mattresses and bedding used in the wards set apart as delivery-rooms. In order that those not connected with institutions of this character may realize the importance which experience attaches to this matter, a short résumé of the rules in force in the institution is here given:

It is necessary to mention, in the first place, that there is nothing in any of the wards which cannot be removed, as stationary wash-stands, etc., and that each ward is only used for four confinements in succession. After the fourth case has been transferred to the convalescent ward at the end of her two weeks, the ward is closed and cleaned. This cleansing is a very careful process, and consists in a twenty-four hours' airing after stripping, the blankets and other bedding being sent to the laundry. The ward is then fumigated with formalin and scrubbed with soap and water and bichloride, and the beds are washed with turpentine and carbolic acid. At the completion of this process the ward is closed for a period of twenty-four hours before being made up anew. The bedding sent to the laundry is boiled and afterward soaked in a solution of bichloride of mercury of the strength of 1:4000. While as near an approach to these rules as may be possible is most desirable in private, it is, of course, often out of the question to in any way control these matters, and, fortunately, the need in the usual run of cases is not great, as if care be taken not to directly infect the case by the use of dirty instruments or fingers the woman will suffer no inconvenience,

even though the conditions are very unpromising as far as bedlinen, etc., are concerned. There is, on the other hand, of course, just as much danger of infection occurring in the private case as in the case of the woman confined in an institution, if the hands or instruments used are unsterile. As regards the instruments, the slightest knowledge of the requirements of modern asepsis will enable this danger to be avoided; but the preparation of the hands is a very different matter. It is to be remembered that complete sterilization in the true surgical sense is at present an impossibility, and the claim of Ahlfeld, that after a careful scrubbing in hot water and alcohol the performance of surgical procedures is without danger, is best looked upon with decided misgiving. It is a much safer stand to assume that if, during the previous two days, the hands have been exposed to the virulent organisms of infection, they cannot be rendered safe to introduce into the vagina. While, of course, this time-limit is artificial, and while also the danger is greatly influenced by the condition of virulence of the particular infection, it is nevertheless a much safer rule to follow than to trust in the efficacy of attempted sterilization.

Exigencies of practice, however, prevent the complete avoidance of hand contamination from all infective agencies, and, therefore, unless some substitute be possible of proposition, the caution just given would be wellnigh useless. Fortunately there is at the present time a perfect means whereby the hand may be rendered absolutely sterile, even though it has been but just removed from a virulent case of infection. This is accomplished by the use of the rubber glove, a means which is of particular importance to the general practitioner, liable as he is to infection many times during the course of his daily work and generally untrained in the details of surgical cleansing of the hands. In the hospital work and private practice of the writer the use of rubber gloves is resorted to whenever there is reason to mistrust the condition of the hands, as by so doing a sense of security is realized impossible by any other means, no matter how carefully the attempted cleansing may have been carried out. It is, however, to be remembered that the use of the glove is to be considered only as an additional safeguard and not as a substitute for hand cleansing. This may seem paradoxical at first sight, but a moment's thought will explain the reason for this statement, since the rubber is so thin that tears may occur at any time during use, and also as one of the effects of the glove is to soften the superficial layers of the skin, thus permitting the germs which may have penetrated deeply to be easily deposited upon any surface with which the hand may come in contact; therefore, the bare hand must never be substituted for the glove except in the case of the most absolute necessity, and then only after the most careful re-sterilization of the hand. The best method for the sterilization of the hands is the scrubbing

in several changes of hot water for a period of at least ten minutes, followed by the use of benzine, alcohol, and bichloride of mercury, or by potassium permanganate, oxalic acid, and bichloride. It is to be borne in mind that the most important part of the process is not the use of the chemical germicides, but the scrubbing in hot water, and that the nail borders and the folds of skin between the fingers and around the joints are the hardest to cleanse and also the most usual sites of germ lodgement. So important is the use of gloves, and so greatly is the safety of the patient enhanced thereby, that there is but little doubt that claims for malpractice would be granted by a jury if it were proved that a delivery was effected without their use by a physician whose personal sterilization was rendered questionable because of immediate previous attendance upon a septic case. Before leaving the subject it will be well to mention another claim presented by the gloves, namely, their use to protect the finger introduced into the rectum in order to cause extension of the head at the outlet of the pelvis. This procedure, while not at all necessary in the majority of cases, is a manœuvre of great value at times, as by its use greater control may be exercised over the head than by the forceps in this terminal stage, thus avoiding the lacerations which so often follow the complete instrumental delivery. As at any moment after the delivery some intra-uterine manipulation may be demanded, it can readily be seen how serviceable any impervious covering will be.

Aside from the question of asepsis, the most important question in the after-treatment of the case is how best to aid nature in restoring the various portions of the genital tract to a condition of involution. In a word, this result is to be secured by the repair of all lacerations of the perineum and by the insistence upon a sufficient period of rest in bed after delivery. While this answer seems simple enough theoretically, the numberless cases which year by year apply to the clinics bear testimony, not always silent, that either the importance of the immediate repair of lacerations of the pelvic floor and the proper period of rest are not understood or that their performance is faulty. As regards lacerations of the soft parts, there can be no question in anyone's mind that the severe grades, such as tears involving the sphincter muscle, demand immediate repair; and it is a fortunate thing that, as a rule, if infection be avoided the result will be satisfactory, healing being perfect. Even at this day, however, the attention of the general practitioner needs to be directed to the evils resulting from neglecting the repair of the much more common tears of the sulci or external perineum. It cannot be too strongly insisted upon that all tears, without regard to position or extent, should be repaired within twenty-four hours after labor, with the exception of lacerations of the cervix. While in the case of the small external lacerations this pro-

cedure is to be advised on the ground only of the avoidance of a certain percentage of morbidity from local septic absorption, in the tears involving the sulci there is a very important additional reason, since the persistence of a laceration tends to the production of a condition of subinvolution of the vagina, with a possible uterine participance, and, secondarily, a condition of loss of support, with its consequent difficulties.

It is therefore most strenuously to be urged that an examination, by sight and touch, be made immediately after every delivery, to determine the condition of the soft parts, and that if any lesion be found an immediate repair be done. As has been said, the cervical lacerations are not included as coming under this rule, it being better not to attempt their repair, save in the event of severe hemorrhage, because of the danger of infection and also because of the probable failure of the operation. The best method, in the writer's opinion, by which to repair perineal tears is the operation devised by Emmet. Of course, the classical form of operation can often not be done, as the denudation is not made according to any fixed rule; but the principles of the operation can be followed, each sulcus being separately repaired and a crown suture being inserted to complete the posterior commissure. It is a point well worth remembering that it is not necessary to include a large amount of tissue in the sutures, as there is no retraction of the muscular parts, and also that it is necessary to exercise caution, lest too great tension be caused by a too tight application of the stitches. Care is, however, necessary as regards the depth to which the needle is carried, as unless the bottom of the laceration is reached and picked up by the suture a dead space will be left, which at this time will become the resting-place of culture media of the highest efficacy.

With regard to the time to be advised during which the patient should remain in bed after delivery, it is to be remembered that no one period can be considered as applicable to all cases, but that each case should be studied as a unit. The writer's plan in hospital and private practice is as follows: After delivery all normal cases are kept in bed for a period of twelve days, and if at the end of that time the uterus does not show a degree of involution sufficient to warrant leaving the bed, the period of rest is continued, and hot douches and strychnine are ordered.

During the first forty-eight hours after delivery the patient is kept lying upon her back, but after that time has elapsed she is encouraged to turn from one to the other side and to spend a portion of the day lying upon her face and abdomen. This change of posture thus early in the puerperal period is a recent modification, and the number of cases observed since it has been established is too small to enable any definite conclusions to be drawn; but the experience so far accords with that of

Beckers,[1] who advocates this early variation of posture as an aid to involution and flow of lochia, and particularly to avoid the occurrence of retrodisplacements of the uterus.

Without question, one of the duties most frequently neglected by the practitioner in charge of an obstetrical case is the examination at the completion of his attendance. That the importance of such an examination, made at the time the patient leaves her bed, is not understood by many physicians is a fact to be deplored, as so much can be done at this time to combat any evils resulting from the just completed gestation. It should be an invariable rule to examine every case at the end of two weeks, in order to determine the existence of any lacerations of the cervix or perineum, and also to satisfy one's self that the uterus is in its normal position and that involution is progressing satisfactorily. The method followed by the writer is to examine every case at the time mentioned, and if any backward malposition of the uterus be found it is corrected and a pessary is inserted, the woman being instructed to return in a short time—a few days at most—in order that immediate dangers of the instrument may be avoided, and later on, that the size of the supporter may be decreased, to avoid interfering with the normal involution of the vagina. It is, of course, unnecessary to state that the position of the uterus should be corrected before the application of any mechanical support. This is, as a rule, easy, provided that the retrodisplacement has been the result of the just completed pregnancy. While the writer is most strong in his belief as to the importance of this examination, and while he believes that one of the causes most frequently operative in the production of retrodisplacements of the womb is pregnancy, and, moreover, that the sooner this malposition be corrected the better from the curative stand-point, he has never felt it wise to follow the rather radical methods of some of the more recent writers on the subject, among whom may be mentioned Ahlfeld, Fritsch, and Rissman,[2] who advise that an examination be made and a pessary inserted, if needed, at the end of the first week. It has seemed that there will still be dangers of possible infection at this early date, and that although the lacerations are, as stated by the authors mentioned, in the stage of granulation at this time, that satisfactory union may be endangered by this early application of the pessary. In the light of the experience acquired since the change of posture during the lying-in-period has been adopted, this early examination would seem also a useless and meddlesome procedure, as almost every case will be found at the final examination to present a uterus in good position if the directed change in posture has been faithfully carried out. Of course, this is only intended to apply to the cases in whom the retrodisplacement is

[1] Münchener med. Wochenschrift, August 21, 1900.
[2] Ibid., March 6, 1900.

the result of the just completed pregnancy. In certain cases of old, backward displacements, good may, in the opinion of many, be accomplished by the use of the pessary; and, while it would seem that the earlier the application the better the results, the dangers noted above render it ill-advised to attempt this early application even here. It is probable that, if the uterus be possible of replacement, the faithful use of the knee-chest posture, together with the change from the dorsal position to the modified Sims, will accomplish as much in aiding the involution of the uterine ligaments, where this is at all possible, as will the use of the pessary during the first few days after delivery. Of course, the pessary should always be inserted, as well in old cases of retrodisplacement as in the recent, at a suitable time, which, in the opinion of the writer, is at the end of the period of bed-rest, which may, as a rule, be stated to be the twelfth day.

In closing it will be well to call the attention of the practitioner to the importance of personally overseeing the application of the pad and binder. As regards the latter, there is no doubt that it subserves a useful purpose in supporting the stretched abdominal muscles, and often aids in the obliteration of the separation so often noted between the recti muscles. In addition, it certainly adds greatly to the comfort of the woman if applied correctly. It should extend from the edge of the ribs to the trochanters, and should be kept smooth, the nurse being compelled to see that its proper position is maintained. This can be best done by making side tucks and pinning the vaginal occlusive dressing to its lower margin, both front and back. The abdominal pad—made by folding a towel of ordinary size until it measures about six inches square—must be applied properly, or its object will not only be defeated, but actual harm will result in a certain proportion of cases by causing a tendency to backward displacements of the uterus. It is to be remembered that the uninstructed nurse will, if left to herself, invariably apply the pad immediately above the symphysis pubis instead of above the fundus uteri. As the only aim of the pad is simply to aid in equalizing the disturbed intra-abdominal tension consequent to the birth of the child, with its resulting diminution in uterine size and overfilling of the abdominal vessels, this position is decidedly faulty, as it not only fails to perform its duty, but also, as has been said, may actually exert a harmful influence upon the uterine body.

FIBROMA OF THE NOSE, WITH REPORT OF A CASE.

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Pure fibromata arising in the nasal chambers and unaccompanied by similar growths in the nasopharynx are comparatively rare, but their occurrence is noted in most treatises on nasal diseases, and cases are cited. The following is the only case of this kind that has come under my notice:

E. J., aged eighteen years, came to the Western Reserve Dispensary, January 20, 1896, with a history of frequent and copious epistaxis and complete stoppage of the left nostril, with a constant purulent discharge from that locality. These symptoms had lasted about thirteen months, with increasing severity, and during that time his general health and strength had become gradually so lowered that at the date of coming to the clinic he was entirely incapacitated for any work. He is the eldest of eight healthy children, and had had no illness previous to this. Parents are both alive and well. No history of any former trouble with the nose or throat.

Patient appeared emaciated and weak, and had slight fever, which he stated was nearly always present. The left side of the face appeared bulging, nose broadened at bridge, causing frog-face. Slight ptosis and exophthalmia, and œdema of lids of left eye, and conjunctivitis on that side. He also complained of sharp, shooting pains over entire left side of head and face. There was present a suppurative otitis media of left ear. On dilating left nostril a grayish tumor, considerably pitted on the presenting surface, appeared protruding into the vestibule and entirely blocking the nostril. The mass was embedded in a thick, glairy, mucopurulent secretion, which showed distinct rise and fall of arterial pulsation. The right nostril contained no growth, but showed the septum bulging considerably to the right side throughout its entire length. A probe on this side passed freely into the nasopharynx. The mass in the left nostril, after cleaning and applying cocaine, was found to be slightly movable by the probe, to which it transmitted a very tough and resilient feeling. The probe, however, could not be passed in any direction around the tumor except in front of it toward the frontal region. Manipulation with the probe caused very free bleeding and some pain, and was followed by a copious discharge of pus. Post-rhinoscopic examination revealed a mass similar in appearance to that seen in front protruding from the inferior and middle meatus. To the finger this mass was hard and very slightly movable. The soft palate was somewhat depressed on the left side, causing thickened speech and difficulty in deglutition. No lymphatic swelling was discovered.

An attempt was made to pass the loop of a cold snare around the tumor, but the wire could not be made to pass alongside of the tumor because of the tough adhesions binding it to the walls of the nostril. By applying the snare twice, however, pieces large enough for microscopic examination were removed, and, although considerable time

was taken to remove these pieces, very free bleeding followed. The nostril was then packed with sterile gauze and the patient instructed to report again.

Sections were prepared by staining with hæmatoxylin and eosin, and showed the tumor to be pure fibroma without sarcomatous change.

At the next visit of our patient he was found in a much worse condition. He reported having had frequent large hemorrhages and an increase in the purulent secretion, with intense pains radiating over entire left side of head. Had had chills and fever, and showed signs of pus absorption. He was advised to go into the hospital and to have the tumor removed as soon and as thoroughly as possible.

Operation performed February 22d. An incision was made, beginning a little inside the inner canthus of left eye and carried across the bridge of nose to same point of sound side, and another begun at this point extended to right ala nasi. These incisions extended to bone. Periosteum was pushed aside and, with Hey's saw, the bones were cut through in the line of skin incision. An incision freeing the nose from the upper lip, but avoiding the gingivolabial fold of mucous membrane, was then made, and the septum divided in a line parallel to its anterior border and connecting with the incision at the bridge of the nose. The nasal bone on left side was then seized with strong forceps and the nose turned over on the left cheek. The slight hemorrhage occasioned by this operation was easily controlled by hæmostatic forceps. By the aid of a powerful electric headlight an excellent view of the tumor was then obtained.

During the preparatory operation described above the posterior nares had been plugged with gauze to prevent the blood from running into the throat. The nostril was now cleansed and the gauze packing in the nasopharynx removed. The tumor was examined clear to its attachment in the superior meatus. By means of a thin-bladed spatula the adhesions fixing the tumor to the nasal walls were broken through, and the loop of cold wire snare was passed along the floor of the nose and, by a finger in the nasopharynx, made to surround the tumor protruding through the choana and pushed up as far toward its pedicle as possible. The nasopharynx was then packed with a sponge, and, the anterior end of the loop having been pushed up to the base of the pedicle, the wire was drawn in by slowly turning the snare screw. The pedicle proved to be extremely tough, and the screw of the snare could only be turned by grasping it with forceps. Before the pedicle was divided the wire pulled through the eye of the snare, and a larger wire was quickly attached to one end of the useless loop and dragged into the same position as the first loop and threaded with the snare. The removal was then finished without further difficulty. The patient's pulse and condition at this stage necessitated frequent stimulation, and for this purpose four hypodermic injections of strychnine (gr. $\frac{1}{30}$) were given at short intervals. Profuse hemorrhage followed the removal of the tumor. After packing tightly for a short time the base of the pedicle was curetted thoroughly and afterward burned with Paquelin cautery. The nostril was then packed with iodoform gauze and the nose stitched back in place with silk sutures. Time of operation, fifty minutes. Free use of strychnine hypodermically, and whiskey by enema was ordered. The method of resecting the nose was, in this instance, the reverse of that usually employed, making the principal incision in the sound side. This was

done on account of the large amount of purulent secretion which had accompanied the case and which it was suspected came from empyema of some or all of the accessory nasal sinuses. The discharge would therefore continue after the removal of the tumor, and it was feared would greatly hinder the proper healing of the line of incision. The measurement of the tumor immediately after removal was 6½ x 2½ x 1½ cm. The pedicle was 4 cm. long and of the same width as the tumor itself. An examination of the eye-ground on left side showed nothing but slight haziness of the fundus.

The patient needed considerable stimulation for two or three days. The first packing was removed after twenty-four hours and a lighter packing substituted. Very profuse purulent discharge was present for the first few days, but little bleeding. Second packing was removed in twenty-four hours and nose was left open. Nostrils were washed frequently with warm boric solution. Primary healing took place in entire line of incision except near canthus of left eye. At this point a little pus was forced through and a small fistula established, which, however, healed in two or three weeks. Patient was discharged from the hospital ten days after operation, and continued to come to dispensary. Recovery and healing were uninterrupted.

Examinations of the site of the tumor have been made since then at intervals of three or four months, but no recurrence has been observed —a period of five and a half years.

The interest in this case lies in the comparative rarity of the tumor in the nose unaccompanied by similar growth in the nasopharynx, and also in the satisfactory result secured by full exposure of the mass and its thorough removal.

THE CLINICAL VALUE OF BLOOD EXAMINATIONS IN APPENDICITIS. A STUDY BASED ON THE EXAMINATION OF ONE HUNDRED AND EIGHTEEN CASES AT THE GERMAN HOSPITAL, PHILADELPHIA.[1]

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The communication which I have the honor of presenting to the Association, by the invitation of your Secretary, is offered with no slight hesitancy, for, at first glance, it must seem somewhat needless to approach a topic already so familiar to all surgeons, thanks largely to the careful studies made by Cabot, Greenough, and others during the past five years. Still, there are reasons which appear to justify a further consideration of this topic. The fact, for example, that certain of the blood changes in appendicitis have been either overlooked or regarded as trivial, in comparison with other more conspicuous features of the

[1] Read by invitation before the American Surgical Association, 1901.

blood picture, and the tendency of some clinicians to attach undue diagnostic and prognostic significance to the blood report, and of others to regard it as untrustworthy—these reasons, perhaps, are of sufficient weight to render the theme less hackneyed than its title leads one to infer.

METHODS AND TECHNIQUE. The conclusions embraced in this report are based upon data derived from the examination of 118 cases of appendicitis in Dr. John B. Deaver's wards at the German Hospital. All these cases were treated surgically, and the statistics relating to the blood changes represent the condition of the blood before operation, usually at the time immediately after the patient's admission to the hospital. The majority of patients were examined but once, and in the few instances in which multiple estimates were made the data of the initial examinations only were included in the analysis.

Most of the examinations were made by various members of the hospital's house-staff, a few by myself. The services of Dr. G. P. Müller, senior resident pathologist at the hospital, in tabulating and classifying the clinical histories of the patients, have been invaluable.

The hæmoglobin estimates were made with a von Fleischl hæmometer, which, for the sake of greater accuracy, was enclosed in a light-proof box provided with a camera-tube limiting the observer's field of vision to the mixing chamber of the instrument. As a rule, a number of different readings were made by several examiners, and the average of the figures most closely corresponding taken as the final estimate.

Both the erythrocytes and the leucocytes were counted with the same instrument, a Thoma-Zeiss erythrocyte pipette, Toisson's solution being used for diluting the blood, generally in the proportion of 1 : 200. Zappert's counting-slide, having a ruled surface equalling that of 3600 of the small squares of the original Thoma-Zeiss cell, was employed in nearly every instance. The erythrocytes in at least 200 and the leucocytes in not less than 3600 of these small squares were counted, to serve as a basis for the calculation of the total number of cells to the cubic millimetre of undiluted blood.

Differential counts were made only in exceptional instances, in those, for example, with a leucocytosis, in which the symptoms did not suggest appendicitis as a factor of the leucocyte increase, and in those with high-grade anæmia. An absence of any important qualitative changes affecting the blood cells in this disease was thought to justify the omission of differential counting as a routine step in all cases in which the symptoms were definite. In those instances in which the percentages of the different forms of leucocytes were calculated, the figures represent the averages of counts of at least 250 cells, made from heat-fixed films, stained with Ehrlich's triple stain, containing acid fuchsin, methyl-green, and orange-G.

Classification. From a hæmatological view-point all forms of appendicitis may be conveniently classified in two general groups: purulent and non-purulent. The first group includes simple catarrhal and interstitial inflammations of the organ, unattended by abscess formation, by gangrene, and by general peritonitis, singly or combined. The second group comprises cases with pus foci resident in or primarily arising from the appendix, with or without a complicating appendicular gangrene and general peritoneal inflammation. It must be admitted that such a vague classification as this is useful only in so far as it relates to the blood changes to be detected by routine clinical examinations—changes by the aid of which the surgeon endeavors to determine the presence or absence of suppuration and peritonitis, and to trace the progress of the lesion from day to day.

Of the 118 cases included in this report, 38 (or 32.2 per cent.) were unattended by pus formation, while in the remaining 80 (or 67.7 per cent.) this condition prevailed, sometimes with and sometimes without further inflammatory changes. These figures, of course, do not represent the usual ratio between the two forms of the disease just specified, since the cases here collected were not examined in an unbroken, consecutive series.

The features of the blood changes of greatest clinical interest in this disease are the anæmia by which it may be accompanied, and the behavior of the leucocytes, the former being sometimes so decided as to constitute a symptom demanding recognition and serious consideration, and the latter being of prime interest in relation to the diagnosis and the prognosis of the attack.

The Anæmia of Appendicitis. Apparently most writers regard this subject as one of comparatively trivial importance, for beyond the general observation that in chronic cases, presumably septic, a variable decrease in the hæmoglobin percentage and in the number of erythrocytes may occur, the question thus far has been dismissed with but casual notice. The fact, however, should not be ignored that the associated anæmia may be so marked as to constitute a symptom demanding careful attention, even should it not be of sufficient gravity to retard convalescence or to endanger the patient's life.

(*a*) *Hæmoglobin.* Practically every case of appendicitis, whatever its character, shows a variable degree of hæmoglobin loss, this decrease occurring with about equal frequency in both the catarrhal and the suppurative forms of the disease, although in the latter it tends to become more striking in the individual case. Speaking in averages, it will be found that the hæmoglobin is diminished to at least one-half of the normal standard in approximately one case in every ten (10.1 per cent.), while in an occasional instance it falls to a figure which the operators are accustomed to regard as perilously low—

40 per cent. or less—in about three cases (2.5 per cent.) out of every hundred. The fact that such low figures are encountered, although but rarely, seems sufficient to call for a routine hæmoglobin test in all cases to be treated surgically, for should the surgeon meet with such a profound oligochromæmia in a patient whose other symptoms demand the use of the knife, the advisability of an operation might appear to him questionable. Not being a surgeon, I cannot presume to discuss this technical point, but simply draw attention to the fact as suggestive, if not really important. It may be added that, judging from the meagre data at my command, an extreme hæmoglobin loss does not appear, *per se*, to be dangerous, since uninterrupted recovery took place in all the three patients of this series in whom hæmoglobin readings of 40 per cent. or lower were made. Positive conclusions, however, are scarcely justifiable, from so small a number of examinations. Judging from this series the average hæmoglobin loss in all forms of appendicitis is about 30 per cent., the average readings for the 118 cases being 70.1 per cent. of normal, or 69.1 per cent. for the catarrhal, and 70.1 per cent. for the suppurative forms.

(*b*) *Erythrocytes.* The erythrocyte loss, save in exceptional instances, is inconspicuous, since in about three out of every five cases (or in 63.5 per cent.) the number of these cells ranges between 4,000,000 and 5,000,000 to the cubic millimetre, while the latter count is exceeded in about one case in every ten (or in 12.7 per cent.). The average loss for the 38 catarrhal cases was 16.2 per cent. (average count 4,186,846), and for the 80 suppurative cases 11.9 per cent. (average count, 4,400,145), while the most striking examples of oligocythæmia in the individual case were practically equal in both forms—59 per cent. decrease in the non-suppurative and 58 per cent. loss in the suppurative, figures corresponding to counts of 2,050,000 and 2,100,000 per cubic millimetre respectively.

These results tend to show that, contrary to the current view, patients suffering from catarrhal appendicitis may be found to be anæmic just as frequently as those suffering from forms of the disease associated with abscess formation and easily recognized symptoms of septicæmia—a characteristic with which I have been frequently impressed long before this attempt was made to analyze the statistics of the blood counts. Perhaps the fact that the majority of these non-suppurative appendicitides were of chronic character, occurring in patients whose constitutions, undermined for a long period, were greatly debilitated, may serve to explain the frequency of anæmia in this variety of disease. Thus it appears that this factor of inadequate blood production is quite as active in provoking anæmia as is the element of sepsis, which is largely responsible for the blood destruction in suppurative appendicitis.

(c) *Color Index.* The color index, or the figure used to indicate the richness in hæmoglobin of the individual erythrocyte, is usually found to be moderately subnormal, ranging from about 0.70 to 0.80 in the great majority of counts. The index for the total 118 cases of this series averaged 0.82 plus, or about 18 points below the arbitrary standard, 1.00; in the 38 non-suppurative cases it was 0.82, and in the 80 with abscess, 0.79. The foregoing data apply, of course, only to averages, but they tend to show that an anæmia of the ordinary secondary type prevails in appendicitis—that is, one in which the hæmoglobin loss is usually somewhat relatively greater than that of the corpuscles. In the individual case, however, the index may fall to quite as low a figure as that commonly found in chlorosis, to 0.53, in one of these cases for example; or, on the other hand, it may rise to as high a figure as that which prevails in typical pernicious anæmia, to 1.50 in another case in the series, for instance.

In cases with severe anæmia deformities of shape and size were commonly noted, but neither nucleated erythrocytes nor decided evidences of atypical staining were observed. The number of stained specimens examined, however, was too small to attach to these remarks any value regarding the occurrence of erythroblasts and of polychromatophilic cells. There is no good reason why both should not be found in cases in which the anæmia is of a sufficiently grave type.

The range of the hæmoglobin and erythrocytes is illustrated by the following table:

TABLE I.—HÆMOGLOBIN AND ERYTHROCYTES.

Hæmoglobin, percentage.	Simple catarrhal and interstitial forms. (38 cases.)			Cases with abscess, gangrene, or general peritonitis. (80 cases.)		
	Acute.	Chronic.	Total.	Acute.	Chronic.	Total.
Above 100 per ct.	1	0	1	0	0	0
90 to 100 "	0	0	0	4	0	4
80 " 90 "	3	6	9	14	3	17
70 " 80 "	4	5	9	26	0	26
60 " 70 "	3	8	11	17	0	17
50 " 60 "	5	1	6	6	0	6
40 " 50 "	2	0	2	6	1	7
30 " 40 "	0	0	0	3	0	3
Highest,	102 per ct.	86 per ct.	102 per ct.	98 per ct.	90 per ct.	98 per ct.
Lowest,	45 "	60 "	45 "	38 "	48 "	38 "
Average,	69 "	72.7 "	69.1 "	71.7 "	76 "	70.1 "
Erythrocytes per c. mm.						
Above 5,000,000	1	3	4	9	2	11
4,000,000–5,000,000	10	13	23	50	2	52
3,000,000–4,000,000	6	4	10	12	0	12
2,000,000–3,000,000	1	0	1	5	0	5
Highest,	5,660,000	5,620,000	5,660,000	5,710,000	5,240,000	5,710,000
Lowest,	2,050,000	3,100,000	2,050,000	2,100,000	4,490,000	2,100,000
Average.	4,240,389	4,348,000	4,186,846	4,872,500	4,925,000	4,400,125

THE RANGE OF THE LEUCOCYTES. The numerical fluctuations of the leucocytes constitute, by all odds, the most important feature of the blood picture associated with this disease, and the behavior of these cells has been regarded as a sign both of diagnostic and prognostic value, to interpret with more or less accuracy the pathological condition of the local lesion, and to furnish information as to the presence or absence of complications. To what extent the leucocyte count can be relied upon as a dependable clinical sign, and to what extent it may prove misleading, in routine clinical work, I have attempted to determine by the following inquiry:

In the catarrhal and interstitial forms of appendicitis, without abscess or any of its consequences, the number of leucocytes, as a rule, does not exceed the maximum normal standard (10,000 per cubic millimetre), and, indeed, is not infrequently much below this figure. In a fairly large proportion of cases, however, exceptions to this rule must be noted, for counts of 12,000, 15,000, or, rarely, even higher may sometimes be encountered. In the present series, 39.4 per cent. of the cases (15 cases) showed a leucocyte increase ranging between 10,000 and 17,000, the latter being the maximum, while in 60.5 per cent. (23 cases) the counts were below 10,000, the minimum estimate being 1600. It may be observed in passing that the maximum count of the individual case of catarrhal appendicitis is somewhat lower than the average count in the purulent variety, to be considered later.

It does not seem unreasonable to attribute the majority of these high counts to the presence of a local non-purulent inflammation restricted to the peritoneal covering of the appendix, since a circumscribed peritonitis of this sort is not uncommon in this form of the disease, and is quite sufficient to account for the leucocytosis. In other cases the possibility that the increase represents simply a blood-finding of the associated anæmia must naturally be suggested; or, again, that it may be the result of blood inspissation, for the production of which copious emesis or purging may have been the factors.

In cases with abscess, gangrene, or general peritonitis a well-marked leucocytosis is found in most instances, the majority of appendicular abscesses raising the count to 15,000 or 20,000 per cubic millimetre, and sometimes to even a higher figure. It is, however, a well-recognized fact that, should the pus focus happen to be so effectually walled off that little or no absorption of the toxic material can occur, such a decided increase may fail to develop. On the other hand, leucocytosis may also be absent, or, indeed, leucopenia may be found, in profoundedly septic patients, in whom the effects of the poison have proved so crippling that reaction is stifled. However active may have been this factor in the experience of others, in my own experience it has been rarely found that a patient's resisting powers were so effectually over-

come that leucocytosis was prevented, for in only two out of my twelve fatal cases (or in 16.6 per cent.) was a well-defined leucocytosis absent, the counts in these two cases being 6000 and 11,200 respectively. In the other ten counts the number of leucocytes ranged from a minimum of 14,200 to a maximum of 58,500, and averaged 19,400 per cubic millimetre.

TABLE II.—FATAL CASES.

No.	Hæmoglobin.	Erythrocytes	Leucocytes.	Remarks.
1	71	4,580,000	11,200	
2	98	5,420,000	14,600	36 hours after operation.
	98	5,460,000	10,200	6 days " "
	96	5,430,000	16,800	9 days " "
3	88	5,280,000	58,500	
4	100	5,120,000	15,200	General peritonitis.
5	85	4,370,000	22,800	
6	75	4,550,000	16,000	
7	68	4,470,000	19,600	
8	79	3,840,000	21,500	
9	94	5,000,000	6,000	
10	95	4,110,000	14,200	Immediately after operation.
	90	4,150,000	20,400	1 day after operation.
11	75	4,970,000	14,800	
12	46	2,760,000	11,600	

From these figures it is natural to infer that the degree of leucocytosis, as determined by a single examination, cannot be relied upon as a prognostic sign. If, however, by repeated examinations a progressive increase in the number of leucocytes is detected, it may generally be concluded that the pus collection has become more extensive or that a general peritonitis has been excited. Such accidents as these were heralded in three cases of this series, by an increase varying from 6600 to 14,000 cells to the cubic millimetre in excess of the number previously counted. Perforation is usually accompanied by an abrupt rise in the leucocytes, although it is to be recalled that in greatly debilitated individuals this increase may be absent, or, indeed, a sudden decrease may occur. Personally, I have not investigated this question with sufficient thoroughness as to warrant definite conclusions as to the behavior of the leucocytes under these circumstances.

Absence of leucocytosis has also been observed in cases in which the pus focus is of small extent, but small abscesses are by no means always associated with low counts, for the intensity of the systemic reaction provoked by the abscess, and not the extent of the latter, appears to be the more active determining factor of the increase.

In the present series the count for purulent cases averaged 17,453, or somewhat less than double the average figure for the catarrhal variety. The leucocytes were in excess of 15,000 per cubic millimetre in 62.5 per cent., or 50 of the counts, and in excess of 20,000 in 25 per cent., or 20 counts, reaching a maximum of 58,500 in a single instance. In

37.5 per cent., or 30 counts, the number of cells was below 15,000, the lowest estimate being 6000.

In the few cases with leucocytosis in which differential counts were made it was found that the increase was due chiefly to a decided absolute and relative increase in the polynuclear neutrophiles, the lymphocytes, the large mononuclear forms, and the eosinophiles being relatively diminished. Neither myelocytes nor basophilic leucocytes were observed in any of the examinations.

The following table represents the range of the leucocytes in the 118 cases examined:

TABLE III.—LEUCOCYTES.

Leucocytes per c.mm.	Simple catarrhal and interstitial forms. (38 cases.)			Cases with abscess, gangrene, or general peritonitis. (80 cases.)		
	Acute.	Chronic.	Total.	Acute.	Chronic.	Total.
Above 50,000	0	0	0	1	0	1
40,000 to 50,000	0	0	0	0	0	0
35,000 " 40,000	0	0	0	2	0	2
30,000 " 35,000	0	0	0	0	0	0
25,000 " 30,000	0	0	0	3	0	3
20,000 " 25,000	0	0	0	14	0	14
15,000 " 20,000	4	0	4	30	0	30
10,000 " 15,000	2	9	11	19	3	22
5,000 " 10,000	8	9	17	7	1	8
Below 5,000	4	2	6	0	0	0
Highest,	17,000	15,000	17,100	58,500	14,600	58,500
Lowest,	1,600	2,400	1,600	6,000	8,800	6,000
Average,	9,124	9,190	9,158	17,718	12,425	17,453

To recapitulate, an analysis of the foregoing data appears to warrant the following conclusions:

1. The average case of appendicitis before operation shows a loss of about 30 per cent. of hæmoglobin and of more than half a million erythrocytes per cubic millimetre. Occasionally the anæmia is of a grade so high that it appears to constitute in itself a serious complication and to raise a doubt as to the safety of surgical interference, should the latter otherwise be indicated. Doubts on this score, however, have not been justified by the records of the cases included in this series.

2. Moderate leucocytosis may occur both in the absence and in the presence of an abscess and its consequences. It accompanies about 35 per cent. of non-purulent and 90 per cent. of purulent cases.

3. Leucocyte counts ranging between 10,000 and 15,000 or 17,000 cannot be depended upon to reflect the nature of the local lesion, since this degree of increase may be found both in mild catarrhal and in purulent cases. Counts of 20,000 or more almost invariably indicate the presence of pus, gangrene, or general peritonitis, one or all.

4. Leucocytosis may be absent both in trivial catarrhal and in fulminant cases, as well as in forms of circumscribed abscess.

5. In operative cases thorough evacuation of the abscess is followed within a few days by a decline to normal in the number of leucocytes, provided that the recovery of the patient is uneventful. Persistence of a leucocytosis after the third or fourth day following the operation may usually be attributed either to undrained pus pockets, to general peritonitis, or to both of these factors.

VALUE OF THE BLOOD CHANGES AS DIAGNOSTIC AND PROGNOSTIC SIGNS. It is obvious that the range of the leucocytes, if correlated with other clinical symptoms, may serve as a diagnostic sign of definite value. On the other hand, the fact cannot be emphasized too forcibly that an absence of leucocytosis, except in conspicuously septic patients, signifies nothing definite.

Regarding a leucocytosis of 20,000 or higher as a practically certain indication of pus or its consequences, in my experience in one out of every four cases of appendicular abscess the diagnosis is justified by the behavior of the leucocytes. This may seem a most conservative estimate of the value of the leucocyte count in recognizing such a condition, and its acceptance certainly restricts the utility of the blood count as a diagnostic aid, but repeated observations have proved the fact that a leucocytosis of less than 20,000, or at the minimum, 17,000, cannot be relied upon as a trustworthy sign of pus, although, as already pointed out, pus may exist with much lower leucocytoses.

In a patient unmistakably septic absence of leucocytosis should be interpreted as a sign of an intense infection, the prognosis of which is more likely grave than favorable. A high leucocytosis in such instances does not necessarily indicate a favorable prognosis, but simply represents an intense infection coupled with normally active resisting powers on the part of the patient.

Absence of leucocytosis in a patient with mild, indefinite symptoms is a clinical sign of no tangible value in so far as it may serve in detecting the presence of pus, since a large abscess, if thoroughly circumscribed, may exist without causing the slightest increase in the number of leucocytes.

In cases treated surgically the adoption of daily leucocyte counting as a routine procedure during the first week after the operation furnishes the surgeon with definite information regarding the progress of the case, since the advent of complications or the failure to secure complete evacuation of pus foci may be detected by the persistence of or an increase in the leucocytosis.

Unfortunately, it happens that just those conditions which bear the closest resemblance to appendicitis, as a rule, give rise to blood changes identical with those found in the latter disease, so that the value of the blood count as a means of differential diagnosis is greatly limited. Thus, leucocytosis is the rule in such conditions as ovarian abscess,

pyosalpinx, ectopic pregnancy, perinephritic abscess, hepatic abscess, empyema of the gall-bladder, and malignant disease of the cæcum, all of which have been confused with appendicitis. Such a large proportion of renal and hepatic colics are associated with inflammatory complications which provoke leucocytosis that neither of these conditions can be distinguished with any degree of confidence from appendicitis simply by the examination of the blood. Acute gastritis is sometimes accompanied by a well-marked leucocytosis, and sometimes by none at all, so that the blood count cannot be relied upon as a clue in distinguishing this disease from appendicitis. The same is true of dysmenorrhœa, in which disease uterine inflammatory changes may be the factor of a leucocyte increase. Should the diagnosis lie between appendicitis and enteric fever, the former is suggested by the presence of a leucocytosis, since this sign practically never occurs in typhoid, except in the event of some obvious complication, such as hemorrhage from the bowel or perforation.

In doubtful cases a leucocytosis is sufficient to exclude such non-inflammatory lesions as simple enteralgia, lead colic, ovarian neuralgia, an ovarian cyst, and a movable kidney.

In conclusion, allow me to urge the more frequent employment of hæmatological examinations, not only for the light which they throw upon the coexisting anæmia present in some instances, but as a means of detecting with certainty a purulent from a non-purulent appendicular lesion in a fairly large percentage of cases. The limited number of non-inflammatory conditions from which this disease may be distinguished by the behavior of the leucocytes should also be remembered. The surgeon who attempts to use the blood count in appendicitis as a definite, pathognomonic sign soon will run afoul of diagnostic disasters, but he who regards it as only a symptom, invariably to be correlated with other equally if not more important clinical manifestations, cannot fail to find this method of inquiry of signal value in routine clinical surgery.

THE BLOOD COUNT AT HIGH ALTITUDES.[1]

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assisted by
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The study of the blood and its changes is extremely interesting. You will pardon the writer for again calling your attention to its consideration. We were made familiar with the number, size, color, shape,

[1] Read before the American Climatological Association, 1901.

and physiological functions of the red blood-corpuscles twenty-five or more years ago in the beginning of our medical reading. Renewed interest has been taken in the study of the blood in recent years. Now, the hæmatologist would have us look to him for the diagnosis of many diseases, and, as general practitioners, we are glad to seek his aid where formerly we were content to rely upon physical examinations.

We wish here to present but one phase of the subject of the blood, viz., that of the red corpuscle count in high altitudes. A number of years ago Paul Bert called the attention of the profession to the discovery he made, that the number of red corpuscles was increased in high altitudes. Since he announced his discovery many physiologists and scientists have confirmed it. The object of our paper is not to add another confirmation to those of other observers, but to give a few investigations that we have made as to the permanency and transitory phases of this increase. For convenience of consideration we will divide the subjects into two divisions, viz., those who have lived for some time at a high altitude and those who go for only a few hours.

The question of an increased blood count in residents of high altitudes may be considered as conceded. Prominent among those who have made this subject a study we find the names of Viault, Egger, Wolf, Herrera and Lope, Solly, and others. The following table, compiled by Herrera and Lope from data of many observers, will show the gradual increase in the blood count as we ascend in altitude:

At Christiania,	sea level	(Iaoche)	4,970,000
" Paris,	78 metres	(Hayem)	5,000,000
" Göttingen,	148 "	(Schaper)	5,225,000
" Tübingen,	314 "	(Reinert)	5,322,000
" Zurich,	412 "	(Stierlin)	5,752,000
" Auerback,	400–450 "	(Wolf and Koppe)	5,748,000
" Reiboldogrun,	700 "	(" " ")	5,970,000
" Arosa,	1800 "	(Egger)	7,000,000
" City of Mexico,	2280 "	(Herrera and Lope) . . .	6,500,000
" Morococha,	4392 "	(Viault)	8,000,000

We note that they found the average at the City of Mexico, 6410 feet, to be 6,500,000. Solly, in counting the blood of twenty-five students of variable length of residence in Colorado Springs, altitude 6000 feet, found the count to be 5,927,000. In four natives, and three who came to Colorado under seven years of age, the average number was 5,724,550. Our own observation on twenty subjects gives us an average of 5,700,300. Thus we note there is a decided increase in the count at 6000 feet over that at sea level. At Morococha, 14,274 feet, Viault found the count to be 8,000,000. There are no records of blood counts of people who have been sometime on the summit of Pike's Peak except that made by Dr. Holmes, of Denver. He examined the blood of a man who had remained on the Peak almost continuously for six months, and found the count to be 6,788,000. We note the marked

difference between the blood counts taken at Colorado Springs and those taken at the City of Mexico at practically the same altitude. This may be due in part to the instruments used, but we believe it to be due in a greater degree to the warmer climate of the City of Mexico. Heat is one of the important factors in producing a permanent rise in the blood count.

To demonstrate the permanent increase we took three Belgian hares to 10,000 feet altitude and two to the top of the Peak. The following table will show the result of the experiment:

No.	6,000 feet.	On arrival, 10,000 feet.	After three weeks, 10,000 feet.	Mesentery.
1	6,070,000	6,880,000	7,462,000	7,715,000
2	6,480,000	6,500,000	7,382,000	7,920,000
3	6,470,000	6,020,000	6,500,000	6,667,000
Average . .	6,340,000	6,467,000	7,148,000	7,434,000

In Nos. 1 and 2 we note quite an increase in the number of corpuscles from a three weeks' sojourn at an increased altitude of 4000 feet. No. 3 did not show the increase, but remained at about the same number. The rabbits taken to the Peak did not do well. The keeper of the Summit House tells us that they became very sick after ten or twelve hours, crying pitifully and panting for breath. Before morning one of them died, demonstrating that Belgian hares can sicken and die at high altitudes. The following is the report on the remaining rabbit after three weeks' stay on the Peak: Count, 6000 feet, 6,280,000; on arrival at summit, 7,200,000; after three weeks on the summit, 7,280,000.

We note the rapid rise on going to the Peak. This rise was only slightly increased by three weeks' stay on the Peak. We observed quite a number of microcytes in the count after the three weeks at a higher altitude. The size of the corpuscles varied. No measurement of the corpuscles was made, but the variation was quite noticeable to the eye.

To what shall we attribute this permanent increase in the count? There is one chief cause, viz., diminished barometric pressure. There are many auxiliary causes. Among these we might mention the greater number of clear days, hence the increased amount of sunlight; the purer atmosphere, hence less obstruction to the sun's rays; the lessened humidity, both absolute and relative; the out-door life of the people permitted by the foregoing conditions. Apropos to this subject we note the conclusions of Herrera and Lope on the modification of the human body from a residence in elevated regions:

"Increase in the number of respirations.

"Increase in the number of pulsations.

" Increase in capacity of respiratory organs.

" Increase in mobility of the walls of the thorax.

" Increase in number of red blood-corpuscles and all principles fixed in the blood in general.

" Increase in density of the blood.

" Increase in density of the urine and all economic liquids in general (secretion of milk, etc.).

" Diminution of the intravascular tension of the blood."

We note these changes throughout the system, and our observations during a residence of eleven years confirm their accuracy. As a result of the diminished barometric pressure we have a diminution in the amount of oxygen or a " reduction of oxygen pressure." The animal economy requires a definite amount of oxygen to maintain its equilibrium, hence changes must take place in the body to meet these requirements. The red blood-corpuscles are the hæmoglobin carriers, hence they would be the first to multiply to meet the necessities of the body. Therefore, the blood-corpuscles remain permanently higher to compensate for the less amount of oxygen in the atmosphere.

The length of time required to establish an equilibrium in the circulation is short. As noted in our experiments on rabbits taken to the Peak, referred to later in our paper, we see the increased count is at first at the expense of the abdominal circulation. In our rabbits after three weeks the count is increased in general, and is as high in the mesentery as in the peripheral capillaries.

We will now call your attention to the rapid increase of blood-corpuscles as we ascend to a high altitude. The facilities for making these observations are as good if not better in Colorado than anywhere in the civilized world. Our city of Colorado Springs, located at the base of Pike's Peak, has an altitude of 6000 feet. We are connected by rail with the summit of the Peak, having an altitude of 14,147 feet. Without any exertion we can be elevated to the summit of the Peak in one and one-half hours. This gives us an opportunity to observe the blood changes and effects of altitude without having to eliminate the element of exercise. The cog road running to the summit of the Peak is well built, and there is comparatively no excitement to cause changes in the circulation. We are indebted to Mr. C. W. Sells, manager of the road, for courtesies shown us and much valuable information given. He informs us there has never been a death on the Peak since the road was open ; and comparatively few persons complain of the effects of altitude.

As preliminary work we took to the Peak during October, 1900, seven young and vigorous men to see whether we would find the blood count increased by an increase in altitude without exertion. We found a material one in five out of the seven, and thought we made mistakes

in the technique of the other two subjects. These observations inspired us to go further into the investigation of the subject, and try to account for this sudden increase. The great amount of labor involved in these observations is only appreciated by those who try to carry them on and at the same time attend to the regular routine of a general practitioner. Owing to this latter fact, I have limited this paper to the consideration of the blood count alone, and have drawn on outside sources for my authority as to blood pressure and other facts. Our observations were not limited to the blood count alone, but we have not had the time to investigate other features of the subject, and we do not give our paper as a complete thesis on blood changes at high altitudes.

I have interested in this work Dr. H. W. Hoagland, to whom I am indebted for a great portion of the practical work and many valuable suggestions.

A few words concerning the technique of our blood counting will suffice. Our examinations were all made with the Thoma-Zeiss apparatus. We were very exact in all details. Two counts were made from two separate drops of each specimen and the average taken. The blood was mainly obtained from the tip of the finger. In the experiments done during massage the blood was taken from the skin of the forearm. The blood was not encouraged to flow by squeezing or stretching the skin, as we found early in our work that these methods changed the count and would furnish unreliable data. The counting was done in Colorado Springs, the pipette being filled at the desired altitude and carefully carried to our office. Being aware of the criticism of the Thoma-Zeiss apparatus (Gottstein) at high altitudes or under diminished barometric pressure, we thought best to make all counts at one altitude. Gowers' solution (sod. sul., acet. acid, and aq.) was used as the diluting medium. We found the rabbit to be rather an unreliable animal for experimental purposes in blood counting. It is difficult to draw blood on the surface of the body unless an extensive laceration is made, except in the ears. They are timid and impressionable, and the circulation in the capillaries of the ears varies greatly under different degrees of excitement, hence they have to be carefully handled.

In our preliminary work we found that the blood count was 250,000 to 500,000 more per cubic millimetre in Colorado Springs than at the sea level. We found an increase of from 300,000 to 500,000 corpuscles per cubic millimetre by ascending Pike's Peak on the cog road without exertion. Was this a fictitious increase, or was there a true multiplication of red corpuscles? This is a mooted question, and it was for the purpose of trying to solve it that the following experiments were made during the past few months. We do not claim originality in all the experiments, but we will say that they were all original with us, as far as the conception in our minds was concerned. We knew not that

others had investigated along the same line until the most of our experiments had been made (*Journal of the American Medical Association*, April 20, 1901).

Being convinced that the rapid multiplication of blood-corpuscles in our preliminary examinations was not a permanent one, we made the following experiments to see if the count could not be varied by many influences not accredited to altitude. The following table will show the effect of running one-half mile:

No.	Name	Age	Weight	Pulse.		Time after meal.	Distance run.	Time in run.	Temp. of room.	Blood count.	
				Rest.	Exercise.					Rest.	Exercise.
1	C.	44	190	82	132	3 hrs.	½ mile	8 min.	65°	5,510,000	5,610,000
2	H.	27	150	82	148	3 "	"	7 "	65	6,460,000	6,360,000
3	W.	24	147	88	134	1 "	"	5 "	67	5,380,000	5,820,000
4	H.	31	145	78	114	2 "	"	8 "	67	5,950,000	6,400,000
5	M.	22	164	66	132	2 "	"	5 "	62	5,330,000	6,570,000
6	C.	18	134	82	150	2 "	"	5 "	62	5,780,000	5,690,000
7	C.	18	135	84	148	2 "	"	5 "	62	5,260,000	5,690,000
8	B.	18	136	60	132	2 "	"	4 "	68	6,570,000	6,660,000
9	B.	14	87	78	142	2 "	"	5 "	68	5,410,000	6,270,000
10	W.	15	154	90	148	2 "	"	6 "	68	5,880,000	6,000,000
Average		23	144	79	138	.....	.....	5 "	.....	5,748,000	6,132,000

The exercise, with one exception, No. 2, increased the blood count. The average count was increased about the same as by an ascent to the Peak without exertion. The heart's action was increased and the peripheral capillaries dilated, as shown by the ruddy color of the skin and the moisture from perspiration. We cannot here account for the increase of count by the multiplication of corpuscles, although some investigators might do so by the abstraction of water by sweating.

Finding that general exercise of the body increased the count, it occurred to us to investigate whether the count could be increased in one member of the body over that found in a corresponding member of the same body. We made seven tests of this character. One arm was kept at perfect rest, while the other arm was massaged and rubbed vigorously for ten minutes. At the same time the subject opened and closed the hand continuously. By these methods we sought to increase the circulation to as great a degree as possible. The counts were made simultaneously in both arms. The following table will show the results of our experiments:

No.	Age.	Weight.	Pulse.	Time after meals.	Arm at rest.	Arm exercised.
1 . . .	18	136	60	2 hours.	5,980,000	6,320,000
2 . . .	15	154	82	2 "	5,830,000	5,940,000
3 . . .	18	160	78	2 "	6,000,000	6,490,000
4 . . .	18	136	60	2 "	5,810,000	6,010,000
5 . . .	17	145	84	2 "	5,770,000	6,000,000
6 . . .	44	190	75	2 "	6,260,000	6,510,000
7 . . .	44	188	78	2 "	5,480,000	5,550,000
Average	25	158	74	.....	5,875,714	6,117,143

We note quite a material increase—241,429—in the blood count. This can only be accounted for by the increased flow of blood in the arm, due to massage, although a possible difference might be produced by an accumulation of carbonic acid in the blood, the result of the violent exercise of the muscles. Cabot tells us that poisoning from carbonic acid gas will increase the blood count. Nevertheless, we believe the increased count was due to vasomotor conditions. There is considerable fatigue to the subject during this experiment. The circulation is slightly quickened, and we noted a higher count in the quiet arm than in the same subjects on other occasions when the blood was counted when the whole body was at rest. Dr. J. K. Mitchell, of Philadelphia, in an interesting paper on "Massage and the Blood" (THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES, vol. cvii.), has shown that the count is invariably increased in massage unless the subject had been physically fatigued immediately before receiving the treatment. Here, again, we have a changed condition of the cutaneous bloodvessels due to manipulation, provided they had not been previously dilated by exercise.

Having satisfied ourselves in our own experiments and by the experiments of others that the blood count could be increased by causing a dilatation of the peripheral capillaries by exercise or manipulation, it occurred to us that we might be able to diminish the count by causing a contraction of the capillaries. We made three counts, with the results as shown in the table following, after packing the arm to the elbow in snow.

No.	Age.	Weight.	Time after meals.	Normal.	Arm in snow 10 minutes.	20 minutes later.
1	44	190	2 hours.	5,510,000	5,140,000	5,430,000
2	18	135	2 "	6,570,000	4,545,000	5,060,000
3	15	154	2 "	5,830,000	4,915,000	5,280,000
Average	25	159	.....	5,970,000	4,870,000	5,257,000

We made three counts of each individual; one in hand not experimented with; one simultaneously in the hand in the snow, and one after reaction had partially taken place. As noted in the table, we were able to materially decrease the count, and it gradually came back toward its normal count as reaction took place.

It also occurred to us to try what effect intense heat would have on the count, knowing that it would produce contraction of the bloodvessels similar to the intense cold. We accepted the proffered courtesies of Dr. B. B. Grover, of this city, and tested five subjects in the Betz hot-air apparatus. The table will show the degree of heat applied and the results on the count.

No.	Age.	Weight.	Pulse.		Degree of heat.	Length of time.	Blood count.	
			Before.	After.			Baked arm.	Outside arm.
1 . .	44	190	78	88	325°	15 min.	4,690,000	5,710,000
2 . .	18	136	60	88	350	10 "	5,460,000	6,050,000
3 . .	15	154	90	100	350	10 "	5,570,000	6,070,000
4 . .	16	152	88	100	350	10 "	5,500,000	5,800,000
5 . .	15	148	96	88	350	10 "	5,800,000	6,480,000
Average	22	156	82	93	.....	.....	5,404,000	6,022,000

The count will be seen to have been materially lessened in the arm subjected to the intense heat. As noted in the experiments where one arm was massaged the general count was increased owing to the subject becoming quite warm. The arm baked perspired quite profusely, and the skin was shrivelled by the sweat when removed from the apparatus. The blood count, being lowered under such an amount of abstraction of watery elements, would indicate that the increase of blood counts cannot be due to the abstraction of water from the surface of the body.

The late spring snows delayed us from making as many experiments as we would like to have done on the top of Pike's Peak before submitting the report of our observations to the Association. But we feel that they have been sufficiently numerous to demonstrate certain features in regard to blood counts. We would call your attention to the following table:

No.	Age.	Wt.	6,000 feet.		10,000 feet.		14,147 feet.		6,000 feet.	
			Pulse	Count.	Pulse	Count.	Pulse	Count.	Pulse	Count.
1	44	189	78	5,760,000	84	6,070,000	84	6,100,000	78	5,790,000
2	27	150	80	6,420,000	104	6,440,000	96	6,510,000	82	5,840,000
3	17	135	80	5,740,000	80	5,700,000	84	5,730,000	78	5,670,000
4	16	150	82	6,150,000	88	6,280,000	80	6,390,000	80	5,970,000
5	19	160	90	6,040,000	84	6,150,000	88	6,240,000	85	6,420,000
6	18	145	60	5,890,000	62	6,750,000	78	6,960,000	60	5,500,000
7	19	120	80	5,680,000	86	6,340,000	92	6,380,000	78	5,575,000
8	40	123	78	6,120,000	80	6,105,000	88	6,485,000	76	5,700,000
9	51	112	84	5,480,000	88	6,670,000	90	6,170,000	80	5,090,000
10	20	140	84	5,170,000	88	5,790,000	96	5,955,000	82	5,790,000
Aver.	27	142	80	5,845,000	84	6,229,500	88	6,292,000	78	5,734,500

The last four subjects were women.

As stated in the beginning of our paper, we want to confine our consideration of the study of the blood to the blood count alone and its probable cause. We made other observations, but will leave them for future consideration. We note from the table that the average blood count at 6000 feet is 5,845,000; that it increases to 6,229,500 at 10,000 feet, and that there is a still further increase on top of the Peak—14,147 feet—to 6,292,000. When we returned to 6000 feet the count again dropped to the normal for this elevation or even below it. We want to say for the subjects of these experiments that they were all healthy

and had been in Colorado for variable lengths of time. The first count was made in the morning before breakfasting, as it is claimed that the count is modified during digestion. The second and third counts, taken at 10,000 feet and 14,147 feet respectively, were made while seated in the railroad carriage, thus doing away with any element of exercise. The only other influence that could have made any impression was the mental excitement incident to the ride up the steep ascent. The subjects were accustomed to mountain life and travel, and were as little excited as it is possible for one to be, hence this element was reduced to a minimum. The fourth count was made on the return to Colorado Springs after a light lunch. We have tried to eliminate all sources of change of the blood count except those due to altitude. From these observations we are convinced that the count is increased in the peripheral bloodvessels as we ascend, and again falls to its normal condition when the original altitude from whence we started is reached.

To further demonstrate this we took three rabbits to the Peak. We examined their blood before starting and immediately on arrival on the Peak. We note the increase in the peripheral count. We also made a count from the mesenteric circulation, which shows a marked diminution as compared with the external capillaries as it also does to what it was on starting from Colorado Springs. The blood for the mesenteric count was taken as follows: The rabbit was fastened to a board. With one stroke of the knife the abdomen was laid open. After drying the surface from which the blood was taken to avoid the possible error of diluting the blood with peritoneal secretion, a small vessel was punctured and blood taken therefrom. The length of time consumed in getting the blood into the pipette was ten to fifteen seconds. The following table will show the results of the experiments:

No.	6,000 feet. Count from ear.	14,147 feet. Count from ear.	14,147 feet. Count from mesentery.
1	6,210,000	6,636,000	5,760,000
2	6,580,000	7,040,000	6,250,000
3	5,520,000	6,230,000	5,700,000
Average	6,087,000	6,635,000	5,897,000

This shows a marked increase in the blood count on rapid ascent—584,000. It also shows that this rapid increase is at the expense of the internal circulation, as the external capillary count shows a plurality over the internal of 738,000. We further note the marked decrease of the internal count—190,000—compared with the count at Colorado Springs before starting.

We are convinced that this rapid increase in the blood count is not a

true multiplication of blood corpuscles, but a fictitious one due to the calling of the blood to the surface of the body incident to diminished barometric pressure and increased heart's action.

Herrera and Lope have shown by extensive experiments that the arterial tension is diminished as the barometric pressure is lessened. They have given us the following law: "When certain conditions are equal the vascular tension is in direct ratio with the barometric pressure." It is not necessary here to outline their experiments, but they have been extensive and their deductions seem conclusive.

A. Mosso, who has experimented extensively in the Alps (*Life of Man on the High Alps*, p. 187), recognizes the dilated condition of the external bloodvessels and the results thereof. He says: "The rapid changes of the pulse observed during ascents, and more especially during mountain sickness, are due to the state of the bloodvessels. When these dilate the resistance opposed to the circulation of the blood is diminished and the heart beats more rapidly."

Our experiments lead us to the following conclusions as to the rapid increase in blood count as we ascend:

1. The blood count increases as we ascend (without exertion) at the rate of 50,000 corpuscles per cubic centimetre of blood per thousand feet.

2. The pulse-rate increases in the same ratio as the blood count, the count rising as the pulse rises, and in like proportion falling when the pulse-rate falls, showing that the heart seeks to overcome the changes brought about by the lessened barometric pressure.

3. The increase is not a true multiplication of the blood-corpuscles, but is due to a changed vasomotor condition in the peripheral vessels incident to diminished barometric pressure. This condition of vasomotor control of circulation and blood count was demonstrated in the various experiments made, where it is shown that the count can be increased or diminished by any means that will dilate or contract the peripheral capillaries.

4. This is further demonstrated by the experiments on the rabbits, which showed the same increase as man, and by the mesenteric count demonstrated that the external capillary count was increased at the expense of the internal abdominal circulation.

5. The increase in blood count disappears and the heart's action returns to the normal when we return to the altitude from whence we started. This is another confirmation of the fact that the increase is a fictitious one, and is due to a diversion of the blood current incident to diminished barometric pressure.

6. The dilatation of the external capillaries (skin and lungs) would not alone account for all the increase, but with this dilatation we have another effect of diminished barometric pressure, viz., diminished arterial tension. With vessels of an increased calibre and a heart with a dimin-

ished force we can plainly see that we will have more or less of a temporary stasis in the dilated capillaries. In the course of time nature seeks to adjust an equilibrium in the economy of those who live at high altitudes. The heart becomes more forcible by the strengthening of its muscles, and the circulation becomes more equitable. Hence the gradual decline in the blood count (Solly) of those who have remained for some time at a high altitude.

7. The want of increase of hæmoglobin in proportion to the increase of blood count in ascents is accounted for by the fact that the blood corpuscles, the carriers of the hæmoglobin, are not increased at once in high altitudes. After remaining some time at a high altitude the true increase in blood-corpuscles takes place, and with it the increase of hæmoglobin.

CRITICAL SUMMARY OF RECENT SURGICAL PROGRESS IN THE DIAGNOSIS AND TREATMENT OF CONTUSIONS OF THE ABDOMEN.

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Subcutaneous injuries of the abdomen vary from a superficial ecchymosis beneath the skin to the most extensive shattering of the peritoneal contents. A simple contusion is one in which the viscera are uninvolved and which ends in recovery. Cases of simple contusion have perished from "shock or disturbance of the solar plexus." Crile[1] holds that the solar plexus may be disregarded as a factor, the cause of the striking phenomena being the mechanical effect of violence on the heart or its nerve mechanism. Hennen[2] reports a fatal internal hemorrhage from the deep epigastric artery in an old man who had been run over by a carriage. Superficial hæmatoma and suppuration may follow a simple contusion. The rectus tends to rupture more than the broad muscles of the parietes. Rupture follows a violent force applied to a normal muscle in extreme tension or a trivial injury to a degenerated muscle. The muscle should be sutured because of the subsequent danger of hernia. Treves[3] argues that the effect of a blow on the abdomen depends upon whether it is anticipated or not and upon the extent of the padding of fat on the parietes. When the blow is anticipated the muscles are instinctively contracted and the body abruptly bent, so that the viscera are provided with a firm but elastic shield, and are removed from danger. According to Makins,[4] of 8153 injuries treated at St. Thomas' Hospital, 292 involved the abdomen, and of these 89 were visceral ruptures.

The effects are manifested immediately, as shock, hemorrhage, and peritonitis; intermediately, as when peritonitis follows a perforation through a contused necrotic patch in the intestine, the patient having been apparently well for one or more days; and remotely, as adhesions, stricture of the bowel, etc., developing after a prolonged period. Disastrous results may follow blunt violence applied to pathological processes, as aneurisms, cysts, and abscesses.

Ruptures of most of the large intra-abdominal vessels have been recorded. Providing there be time, the abdomen should be opened and the hemorrhage checked. If the vessel be severely contused, the symptoms of hemorrhage may be postponed until sloughing of the arterial wall ensue. Thrombosis, embolism, or stenosis of the vessel may occur, and the part supplied by the affected artery may become gangrenous. Aneurisms may develop. Recently we examined a man who, some ten years since, received a severe blow in the right iliac region. He was considerably shocked, and within a few days a large tumor appeared at the injured point. The mass increased in size for several months, then remained stationary for a long time, and finally began to subside. He presented a stony swelling about the size of two fists, which we believe to be a cured aneurism of the iliac artery.

Of 13 aneurisms of the renal artery collected by Keen,[5] 6 were traumatic, and of these 2 were subjected to nephrectomy and recovered. The other 4 died at periods ranging from thirty days to four years after injury.

Stomach. From its elasticity and its more protected position beneath the ribs the stomach is less liable to be affected by trauma than the intestines. The anterior wall is the most frequent site for rupture. "One case is reported in which operation was done on the fourteenth day; a tear 4 cm. long was found. The stomach contents had been walled off by a local peritonitis. Recovery took place. An incomplete separation and laceration of the mucous coat of the stomach is not uncommon. Ziegler reports a cyst which formed in the anterior wall of the stomach, probably from a contusion of the upper abdomen" (Scudder[6]). A tear of the mucous coat may exist opposite the breach in the peritoneum, the muscular tunic remaining intact (Devergie[7]). Shock, peritonitis, and gastrorrhagia are the symptoms. In 6 of 11 cases studied by Scudder[6] hæmatemesis was especially mentioned. In one case in which this symptom was absent there was a complete rupture near the pylorus. Of 11 fatal cases the longest period of life following the accident was fourteen hours.

Intestines. In Makins'[4] series of 89 visceral ruptures, 21 involved the intestines. Of 71 contusion of the abdomen, 20 per cent. had intestinal rupture (Bryant[8]). Of 80 analyzed by Scudder,[6] 36 were from horse kicks, 23 from carriage-wheel accidents, 13 from man kicks, and 8 from spent shells. Keenan[9] states that the forces producing rupture

are sudden sharp blows and heavy lacerating forces. The former cause 70 per cent. and the latter 30 per cent. of all ruptures. As Bryant[8] has shown, the sharp blow usually produces a single tear, while crushes often cause several lacerations. To these we add abdominal concussion, as falls from heights or blows upon the back in which the abdomen is not struck. Curtis[10] concluded that the so-called rupture is really a contused lacerated wound, caused by a crushing between the vulnerating body and the bony parts behind. The possibility of rupture by concussion, however, must not be overlooked. Grieg Smith[11] cites two cases of rupture of the duodenum caused by blows on the back; in neither was there fracture of the spine nor any injury in front. Of 36 horse kicks of the abdomen, 35 had ruptured intestine (Chevasse[12]); of 25 histories of horse kicks, 24 had intestinal laceration (Keenan[9]). The most common causes, then, are kicks and car accidents.

Of the 116 collected by Curtis,[10] 112 were in the small intestine. Of Makins'[4] 21 cases, 16 were in the small intestine. Keenan[9] says the portions of intestine most frequently injured are the upper part of the jejunum and the lower part of the ileum, places where a movable portion of the gut is attached to a more fixed one. Makins[4] calls that portion of the abdomen below the umbilicus the "dangerous area," as he affirms it is here that, as a rule, the intestine must lie to be crushed against the spine. Scudder[6] believes 75 per cent. of intestinal ruptures are in the small bowel, the jejunum and lower ileum being injured most often, and that there is usually more than one rupture found. Makins[4] mentions but two multiple rents in his series. In one-tenth of Curtis'[10] cases the ruptures were multiple. In Makins'[4] cases the amount of actual fecal matter in the peritoneal cavity was very small. He calls attention to the experiments of Travers concerning the contraction of the muscular coats and the eversion of mucous membrane which tend to prevent the escape of the intestinal contents. Complete division of the small intestine has been recorded, no effusion of the contents following. One patient lived eight days, and, owing to the tight contraction of the circular fibres of each end of the divided gut, there was no escape of fecal matter.[13] Rehn[14] operated on a suspected case of perforation nine hours after injury, and found, instead of a perforation, a tetanic contraction of the intestine. Jordan,[15] while removing a ruptured spleen, noticed the small intestine still contracted from the injury received. One could conceive of the possibility of a traumatic intussusception, but of this we have seen no record. Turner[16] reports a volvulus in a boy seven years of age, who fell, striking against a pole. He was operated upon twenty-four hours later, and a mass of adherent twisted intestine found on the left side of the abdomen. Nowack[17] publishes four cases of peritoneal adhesions after abdominal contusions. Operation was performed in all; there were invariably

adhesions between the parietes and the omentum, which involved also the colon and usually one or two loops of small intestine. We operated on a case of this character in which pus formed among the adhesions three months after the contusion. Symptoms of peritonitis may be delayed as long as five or ten days, until a contused area in the bowel has perforated, a necrosis following the contusion. Contusion of the gut alone may lead to peritonitis, the diminished vitality allowing the micro-organisms to penetrate the tissues. The following case illustrates this point: A kick on the left abdomen was received from a companion. The injury was considered trivial. Next day the patient complained of pain, and the third day vomited and took to bed. We saw him for the first time and operated on the fourth day. The ileum was adherent to the abdominal wall, and, together with the appendix, violently inflamed. There was no perforation. Keenan[9] cites the case of a boy who was kicked in the epigastric region. Nothing seemed to indicate a serious injury. Six days later he suddenly died. A perforation of the intestine was found.

Barker[18] details the history of an abdominal contusion, followed by stricture of the intestine and pernicious anæmia.

Van Zwalenburg[19] reports a sarcoma of the intestine in a child five years of age, who had fallen from a fence five months before, and was caught between two boards and held hanging on the abdomen. Albion[20] mentions traumatism as a cause in 2 of the 10 sarcomata of the intestine which he collected.

Small[21] reports 13 cases of traumatic appendicitis. We have operated on 3 patients who attributed their appendicial trouble to trauma. Fowler[22] considers traumatism scarcely possible as an etiological factor.

Contusion probably, and concussion undoubtedly, predisposes to hernia of the bowel through the anatomical rings and to prolapse of the various organs. The contents of a hernial sac may be damaged by a contusion.

Symptoms. The degree of shock is variable, and is independent of the severity of the blow. In Makins'[4] series 6 were profoundly and 8 lightly shocked. In 3 no mention was made of shock, and in 3 it was definitely stated to be absent. We recall a man who was so profoundly collapsed, following a run-over accident, that death was unhesitatingly predicted, yet when the shock subsided he speedily recovered. Keenan[9] studied 70 cases reported since 1893. He declares that shock occurs in 60 per cent. of abdominal contusions, and in about 80 per cent. of lacerations of the gastro-intestinal canal. Pain was mentioned in 93 per cent.; it was in no proportion to the amount of injury inflicted. Makins considers pain a constant sign, and rigidity and immobilization of the abdominal wall almost constant. In Keenan's series rigidity occurred in 84 per cent. He thinks it occurs without visceral

lesion, as shown by cases mentioned by Adam,[23] Manly,[24] and one of his own. Hartmann[25] believes rigidity is an imperative indication for laparotomy, even though other signs are absent. Of 10 cases presenting this sign, 9 were successfully operated upon and distinct lesions found; the remaining case, refusing operation, died as the result of an intestinal perforation. Of 17 cases without rigidity and who were not subjected to operation, all recovered. One would think tenderness were constant. It was absent in 2 of Makins' cases.

Abdominal distention indicates peritonitis. Absence of liver dulness is rare. Makins[4] mentions but 1 case; it occurred in 2 per cent. of Keenan's[9] cases, and in 4 per cent. of those collected by Curtis.[10] Makins lays some stress on localized impairment of resonance, which, he says, is due to the effusion and plastic lymph producing early adhesions. More extensive areas of dulness are due to contraction and collapse of large segments of bowel, which almost always accompanies these injuries, but which does not necessarily mean rupture. Cellular emphysema occurred twice in Makins' collection. It indicates a lesion of the bowel beyond the limits of the peritoneal coat. Dulness in the flanks would indicate fluid in the peritoneal cavity, which might be serous, fecal, or sanguineous. Unlike perforation from ulceration, fecal extravasation is rarely great in rupture of the bowel, owing to the retraction of the muscular coat. Hemorrhage would hardly be sufficient to cause this sign, unless the mesentery or some other vascular structure be also torn. Tenesmus, with frequent desire to defecate, is sometimes encountered. Vomiting was observed in 83 per cent. of the cases studied by Keenan; it also occurred several times without rupture. Absence of peristalsis and a friction sound on auscultation are indicative of peritonitis. Rectal examination will detect a resistance in the vicinity of the rupture in some instances; this is due to the formation of adhesions around the laceration. Bright blood in the stools would point to a rent in the large bowel, and tarry stools to a lesion higher in the intestinal tract. The temperature, pulse, and respirations augment as a rule. An examination of the blood may contribute to the formation of a diagnosis in doubtful cases. Bloodgood[26] says examinations of the blood after abdominal contusions to ascertain the existence of shock, hemorrhage, or peritonitis are not sufficient in number to allow of any conclusions. The facies will be of value to the experienced observer. Rectal insufflation with hydrogen (Senn) or ether (Sutton[27]) is considered dangerous by many surgeons.

The signs and symptoms we discern are due to peritoneal infection, the very onset of which we should make an effort to recognize. Obliteration of liver dulness in a flat belly or resonance over the posterior and lateral area of hepatic dulness in a distended abdomen, and cellular emphysema are the only pathognomonic signs of ruptured intestine.

These are not due to infection, but are rare signs of rupture, not ulcerative perforation of the gut.

The occurrence of any of the above signs should make us suspicious, and suspicion should in most instances be synonymous with exploration. Keenan[9] quotes Manly,[24] Deaver,[28] Tillmans,[29] Shields,[30] and Battle,[31] who would watch for bad signs, and on their appearance operate. Lambert,[32] Rogers,[33] Laplace,[34] Balladur,[35] and McDonald[36] would perform immediate exploratory laparotomy in all cases of contusion. Keenan[9] maintains a position between these two. He would, while paying close attention to the symptoms, operate on the history rather than wait for a certain diagnosis. He quotes Kemisson,[37] who gives a person who has been kicked in the abdomen one chance out of three of dying, without operation.

Twelve years ago rupture of the intestine was regarded as mortal. J. Croft[38] reported the first successful operation for this injury in 1889. Angerer,[39] in the discussion on contusions of the abdomen at the German Surgical Congress, April, 1900, reported 9 cases of rupture of the intestine, with 2 recoveries. Of 162 cases not operated upon 11 recovered, and several of these had fecal fistula. In Makins'[4] series 15 were operated upon, with 3 recoveries, 20 per cent. The unoperated cases died. The prognosis will depend on other visceral lesions, the extent of the local injury, the previous condition of the patient, and the degree of emptiness of the bowel. A perpendicular blow is more harmful than an oblique one. Makins[4] believes rupture of the small intestine to be more dangerous, because it is movable, and because the fluid contents will pass out more readily and infect the peritoneal cavity. The contents of the large intestine often glide by the opening without escaping, and when they do escape it may be on the outer side of the colon or retroperitoneally, where a local abscess is more liable to form. Scudder[6] asserts that wounds of the duodenum and jejunum are less fatal than those of the lower ileum and colon, because the bacterial flora is more scanty than in the lower part of the intestinal canal.

If the symptoms point to dangerous hemorrhage operate at once, otherwise do not operate until reaction has been obtained (Da Costa[40]). Make a median incision below the umbilicus, as it will be near the injury, it may avoid the bruised parietes and it will permit of a satisfactory cleansing of the peritoneum (Makins[4]). Search for the rupture in a line from the seat of the surface injury back to the lumbar spine (Scudder[6]). You cannot be sure, however, of finding all the lesions unless the whole intestinal canal be inspected. Perforations have not infrequently been overlooked. Avoid evisceration and treat discolored spots as ruptures (Keenan[9]). If the injury be caused by a crush the peritoneal wound will be smaller than that in the inner coats. Be sure to reinforce all the peritoneum covering the lacerated mucous and muscular coats

(Scudder[8]). Suture longitudinal rents transversely (Angerer[39]). If resection be necessary, because of the severity of the contusion, extent of the laceration, or because of detachment or injury of the mesentery, employ the Murphy button to save time. In a recent case we packed off with gauze a coil of gut whose integrity we questioned. Wipe the infected area with a dry sponge and irrigate (Makins). Avoid drainage if possible. Moynihan[41] reports a case of complete rupture of the duodenum jejunal juncture. An end-to end approximation was impossible. The duodenum was therefore closed and the jejunum implanted in the anterior wall of the stomach with the aid of a Murphy button. The patient died on the one hundred and fourth day after operation, from perforation of the duodenum due to the Murphy button.

Vaughan[42] reports 3 cases of rupture of the intestine following contusion of the abdomen. Two were operated upon, and all 3 were fatal. Scudder[43] had under his care a man who was crushed between a platform and a moving car. On the sixth day a fecal abscess in the left iliac fossa was evacuated, at the extreme depth of which was discovered an opening into the descending colon. Later the fecal fistula was successfully closed. Fiske[44] narrates a similar case. Berg[45] successfully sutured a ruptured duodeno-jejunal flexure twenty-five hours after a run-over accident. Buchanan[46] reports a lacerated intestine following a blow from a pair of tongs. Recovery followed operation.

Elliott[47] operated on a boy who had been struck by a trolley-car fender, suturing a rent of the small intestine. Recovery ensued. Roestal[48] records an intestinal perforation from contusion in which shock was so great that no operation was performed. Later an abscess developed, was opened, and recovery followed. Taylor[49] relates a case of perforation from the kick of a gun. Operation was done two days after in the presence of a general peritonitis. Death occurred seven days after the injury. Turner[16] reports 2 cases in which operation was followed by recovery in 1. The fatal case was complicated with a torn pancreas. Myles[50] removed eight feet four and a half inches of gangrenous intestine following a contusion of the abdomen.

Omentum and Mesentery. The immediate danger is hemorrhage. Later the omentum may develop an inflammatory mass or contract embarrassing adhesions. Violent contusion of the mesentery or stripping of the mesentery from the bowel would cause intestinal gangrene. Le Conte recently operated on a case in which it was necessary to resect seventy-one inches of intestine because of a wound in the mesentery near the spinal column. Adventitious openings through which the intestine may become strangulated have been noted. Slit-like holes are due to injury, round holes are congenital (Treves[51]). Of 89 visceral ruptures 3 or 3.37 per cent. were of the mesentery and all the result of buffer accidents (Makins[4]). If the injury has not been to the hepatic or

splenic area, if there be movable dulness in the flanks with other signs of internal hemorrhage, the diagnosis of ruptured mesentery or omentum may be assumed. Do not wait for the reaction that will never occur, but open the abdomen immediately and secure the bleeding vessels. Prolonged shock or secondary shock probably means hemorrhage. Mesenteric cysts may develop after an injury; they usually contain blood.

LIVER. Of 89 visceral ruptures, 16.85 per cent. were of the liver. The same general causes that produce intestinal rupture produce laceration of the liver. They may follow a fall on the feet from a height, and it has been said a sudden action of the abdominal muscles has caused it. Hewitt[53] says rupture of the liver has actually occurred from a vigorous application of artificial respiration. The right lobe is more frequently injured than the left; it may be completely divided. It is often accompanied by other visceral lesions. Of 543 cases of injury to the liver, more than one-half died of hemorrhage within twenty-four hours (Scudder[6]). Like other intraperitoneal hemorrhages, there is but little tendency for the bleeding to cease spontaneously. Pain is severe and shock profound. There are symptoms of internal bleeding, with movable dulness in the flanks. The hepatic dulness is increased. Pruritus and jaundice sometimes develop after twenty-four hours. Bile and sugar occasionally appear in the urine. Peritonitis frequently occurs in a patient who survives the initial shock and subsequent hemorrhage. Among the remote results should be mentioned abscess and diabetes. Operation is imperative to check hemorrhage. There are three methods of hæmostasis—suture and ligature, cautery, and the tampon. Sutures should be employed whenever applicable. They may tear out, may fail to stop bleeding, and the wound may be inaccessible. Then gauze packing should be utilized. Cauterization is not suitable for large wounds, and is liable to be followed by secondary hemorrhage. Vaughan[42] reports 2 fatal cases of rupture of the liver.

H. B. Delatour[53] reports 2 cases successfully treated by operation. Turner[18] reports a fatal case of ruptured liver and kidney following a blow from the pole of an omnibus.

Ruptures of the gall-bladder, cystic, hepatic, and common biliary ducts have occurred. Cholelithiasis would predispose to injury of the gall-bladder.

Van Schneppel[54] speaks of cholecystitis from trauma, gallstone being present. Garrett[55] reports a rupture of the hepatic duct following a fall on the abdomen. Recovery followed laparotomy and drainage. He mentions 6 other cases, and quotes Miles F. Porter: "The symptoms as they occur are pain, shock, ascites, acholia, jaundice, cholæmia, peritonitis, inanition. . . . Injuries of the common duct, when they result in complete diversion of the bile from the intestine, are inevitably fatal unless by some means the diversion be overcome." A large bile cyst

sometimes forms. The proper channel may become re-established, as proven by cases that have recovered and by the experiments of Sir Benjamin Brodie, Tiedeman, and Gmelin. The gall-bladder should be sutured or removed according to the degree of laceration. It may be completely torn from its connections. From our reading we gather that incision and drainage are all that have been done for ruptured ducts. An anastomosis would be the ideal treatment.

SPLEEN. Splenic rupture is not as frequent as rupture of the liver. It occurred in 11.23 per cent. of Makins'[74] cases. An enlarged spleen is predisposed to injury. Owing to its secluded position beneath the costal margin, the overlying and protecting ribs are frequently fractured in traumatic lesions of this organ. Hemorrhage is the great danger, but is not as rapidly fatal as the vascularity of the spleen would lead one to suppose. This is due to the elasticity of the organ permitting retraction and to the fact that the blood in it coagulates rapidly, a large number of leucocytes being present. Abscess or peritonitis may follow. The symptoms are those of internal hemorrhage, with pain and tenderness over the spleen. The splenic dulness is increased. The dulness in the left flank frequently does not disappear when the patient is turned on the right side, owing to the fact that the blood is often clotted.

Do not wait for reaction. Some, however, maintain that there is a distinct reaction, and that its appearance should be seized as the favorable opportunity for operation, which consists of splenectomy, splenorrhaphy, cauterization, or packing with gauze. The choice of operation depends upon the condition of the patient and of the spleen. If the patient has lost much blood, if the spleen is large and extensively adherent, if the tear is favorably situated, suture is to be chosen. If the capsule is thin, the spleen soft, and the tear inaccessible, packing is to be considered. Ordinarily, with a normal spleen, particularly if the laceration is great, splenectomy is the best operation (Scudder[6]). Since 1890, 34 cases of splenectomy for rupture of the spleen have been reported, with a mortality of 41.2 per cent. Excepting cases of more superficial injury, splenectomy is the operation which will be resorted to in the future (Warren[56]). Jordan[15] says there are on record 135 cases of injury to the spleen; 5 healed spontaneously, 16 were saved by excision, and 104 died, 3 from abscess, and the rest from hemorrhage. Kellock[57] reports a splenectomy for an extensively lacerated spleen. Five days later the patient died with symptoms of obstruction, which were due to bruising of the small intestine a few inches above the cæcum. He cites a second case accompanied by a lacerated liver. The patient did not survive operation. Mixter[58] details the history of a successful splenectomy for rupture. The splenic artery was torn and spurting. There was dulness in both flanks, showing that the blood was not clotted.

PANCREAS. Uncomplicated rupture of the pancreas does not occur. That partial laceration without implication of environing organs takes

place is evidenced by the pancreatic cicatrices revealed at autopsies. Slight hemorrhages are not infrequent after contusions in individuals with friable arteries or with pancreatic congestion from interference with the venous return. Pancreatic rupture is usually rapidly fatal from hemorrhage. Gangrene or suppuration often follows when the bleeding is not mortal. Some 17 cysts of traumatic origin are on record. It is likely that many of these so-called cysts are really collections of blood and pancreatic fluid in the lesser peritoneal cavity (Scudder[6]). Chronic pancreatitis may ensue. Robson[59] tells us that the pancreatic tissue is soft and easily bruised, so that, although it is well protected, yet a slight injury takes more effect on it than on many firmer organs. He mentions a case of acute hemorrhagic pancreatitis following trauma. The symptoms of laceration of the pancreas are those of shock and internal hemorrhage. The bleeding is checked by ligature, packing, or partial excision. It has been proven experimentally that the pancreas may be entirely removed and the animal live. This has not been proven in practice. Partial extirpation is proper as long as the canal of Santorini is left (Ceccherelli[60]). The escape of sterile pancreatic juice into the abdominal cavity does not necessarily mean peritonitis. When discharged externally through a fistula it digests the skin, but it is probably rapidly absorbed from the peritoneal cavity. Suppuration and gangrene should be combated by epigastric or lumbar incision and drainage. Cysts are to be marsupiated. Chronic pancreatitis is amenable to drainage, but here the drainage is indirect through the bile ducts after a cholecystotomy or cholecystenterostomy. The drainage causes a subsidence of the pancreatitis, then an opening of the common duct by relief of tension, and so to a cure of the patient (Mayo Robson[59]).

KIDNEY. Of 89 ruptures of the abdominal viscera 39.32 per cent. were of the kidney (Makins[4]). The kidney is well protected by its position and by an enveloping bed of fat, yet it is frequently injured. Rupture is rarely bilateral and is usually transverse to the long axis of the kidney. "If the kidney is simply contused, hemorrhage will take place within the kidney capsule; if the renal capsule is torn, hemorrhage will occur into the perinephritic tissues forming a pseudo-hydro-hæmatonephrosis; if the peritoneum is torn, it is possible for both urine and blood to accumulate within the abdominal cavity. Herzog finds that in falls and blows upon the lumbar region the hilus of the kidney is torn and that retroperitoneal hemorrhage is present. On the other hand, he finds that in crushes from the front the kidney is torn anteriorly and crushed, and that hemorrhage usually takes place into the general peritoneal space." Keen[61] says involvement of the peritoneum with rupture of the kidney is more frequent in childhood than in adult life, owing to the fact that the kidney is not separated from the peritoneum by fat, the perinephritic fat developing late.

Bilateral and occasionally unilateral injury of the kidney is fatal from anuria, the sound kidney refusing to act from some reflex cause. Of 198 cases, Maas[62] and Spencer,[61] 15 died of shock and secondary hemorrhage, 6 of secondary hemorrhage, and 1 of continuous hemorrhage. The symptoms are shock, pain, and hæmaturia. Hæmaturia was absent in 10 of the 189 cases; it was occasioned by a clot in the ureter, a thrombosis of the renal vessels, and a pre-existing stricture of the ureter. Extensive laceration of the pelvis of the kidney or complete separation of the kidney from the ureter would also explain the absence of blood in the urine. Newman[61] had a patient who had hæmaturia following a blow on the loin. No lesion of the kidney existed, the hæmaturia being due to a papilloma of the bladder. Hæmaturia may not appear until several days after the injury.

Hemorrhage and sepsis are the dangers. The symptoms of internal hemorrhage and an increasing tumor in the loin demand immediate exploration. Hæmaturia is an unsafe guide as to the extent of kidney injury. If on exploration the kidney be found hopelessly destroyed, or ligation of the renal vessels be necessary to control bleeding, the kidney should be removed at once, taking the chances of the existence and integrity of the opposite kidney. If but moderate laceration be present, disinfection and drainage or partial nephrectomy is indicated. If the evidence point to intraperitoneal bleeding or to lesions of the other abdominal organs, laparotomy should be performed and the kidney treated as before. The graver cases do not recover without operation. The surgeon should lean toward exploration in doubtful cases, and in severe laceration toward nephrectomy (Keen[61]). The statistics demonstrate that primary nephrectomy is much safer than a secondary nephrectomy after sepsis has appeared.

Many of the cases are mild, and of these many recover. They are treated by ice to the loin, internal astringents, and rest.

Turner,[16] Kellock,[57] and Mixter[58] each publish the notes of a successful nephrectomy for rupture of the kidney following trauma.

Ureter. Rupture of the ureter is caused by the vulnerating force pressing the ureter against the transverse process of the third, fourth, or fifth lumbar vertebra or by traction on the ureter. All ruptures are above the pelvic brim. Of the 23 recorded cases 5 had contracted ureters, with hydronephrosis after trauma. Two, Poland and Mackensie, were undoubtedly ruptures of the ureter.

Shock is not profound or persistent unless there be some injury to the other abdominal organs. A few drops of blood in the urine, with persistent pain and tenderness in the side, point to injury of the ureter. If the ureter be completely torn across a retroperitoneal accumulation of urine and blood will appear after several days. A differential diagnosis cannot be made between rupture of the pelvis of the kidney and ruptured ureter. Complete obstruction of the ureter will cause atrophy of the

kidney; partial obliteration may result in a pyonephrosis or hydronephrosis. There is little tendency for spontaneous repair. If the injury be uncomplicated there is little danger to life. A tear in the peritoneum may lead to a fatal peritonitis. The symptoms are often delayed, due to the fact that a primary bruising subsequently ruptures through a necrosis of the ureteral wall.

Immediate anastomosis is the ideal treatment, but this has never, as yet, been done. Lumbar incision and drainage are indicated after infection has taken place; it would be difficult to find the ureter, and even if it could be found, failure would probably attend an effort at anastomosis. Aspiration of the retroperitoneal accumulation has been successful in some cases. Nephrectomy may be necessary as a secondary operation (Scudder[6]).

BLADDER. Rupture of the bladder is intraperitoneal, extraperitoneal, and combined extraperitoneal and intraperitoneal; simple or complicated. Laceration of the bladder mucous membrane, with hæmaturia, may follow a blow on the hypogastrium. Intraperitoneal rupture is due, in most cases, to the forcing backward of the distended viscus against the promontory of the sacrum, although in some cases it may result from contrecoup (Alexander[63]). Extraperitoneal rupture is often associated with fracture of the pelvis. In uncomplicated cases the rent is vertical and occurs at the upper and posterior part of the bladder. If the tear does not extend through the muscular tunic symptoms may be delayed until sloughing completes the perforation (Scudder[6]). Normal urine may come in contact with the peritoneum without producing infection, but when bacteria are present inflammation ensues in a very short time.

Alexander[63] tabulates 45 cases of intraperitoneal rupture of the bladder treated by laparotomy and suture, and 6 cases that were treated by abdominal section without suture. Of the former 23 died, 16 from peritonitis, of which 4 at least were due to imperfect suturing, 2 to shock, 2 to hemorrhage, one primary and one secondary, 1 to pneumonia, and 2 died on the table. Of the latter, 3 died. Without operation all hope must be abandoned. The first recovery after intraperitoneal rupture of the bladder was reported by Walters,[64] of Pittsburg, in 1861. He simply opened the abdomen and drained. The symptoms are shock, hypogastric pain, sensation of something having given way inside, rectal tenesmus, and an urgent desire to urinate, but inability to accomplish the act. The catheter reveals a little bloody urine or no urine at all; it may pass directly into the abdominal cavity. Cases have occurred in which unstained urine has been withdrawn from a torn bladder. This injection test is not infallible. In Alexander's[63] patient eight ounces of salt solution were injected and eight ounces were withdrawn, yet an intraperitoneal laceration four inches long existed. Air (Keen) or hydrogen (Senn) may be pumped into the bladder. Alexander says this inflation

is useless when the intestines are tympanitic, and always dangerous because it spreads infection and adds to shock. Dulness in the flanks suggests intraperitoneal rupture, while unilateral tenderness and tumor point to rupture outside the bladder (Scudder[6]). Alexander maintains that it is not necessary to make a differential diagnosis, as both require immediate incision of the abdominal wall. He advises exploring the prevesical space through a suprapubic incision, and, if this is healthy, extending the incision upward, and so open the abdominal cavity. Treatment consists of early operation, cleansing the peritoneal cavity, and careful suturing of the tear, Extraperitoneal rupture is treated by drainage.

DIAPHRAGM. Vaughan[42] reports a left-sided rupture of the diaphragm in a man who was struck on the back by the débris from a blast. Death ensued in twenty-four hours. Almost the entire stomach had entered the pleural cavity. Walker[65] details the history of a strangulated hernia through a rupture of the diaphragm on the left side, following a blow from a falling tree. A knuckle of bowel about eight inches in length was withdrawn from the pleural cavity, and the rent in the diaphragm closed with catgut sutures. Recovery ensued. He quotes Bowditch, who studied 88 cases, and found the large majority to have occurred on the left side. This he believes to be due to the fact that the liver is on the right side, to the greater length and strength of the right crus of the diaphragm, and because two fibrous bands exist in the right side of the diaphragm that are not found on the left. Dyspnœa, intense pain, cough, thirst, and hiccough are mentioned as symptoms. The physical signs resemble those of pneumothorax. A tympanitic note over the area where prolapsed gut is situated, amphoric tinkling, and sometimes succussion sounds are present. Litten[66] describes a horizontal depression crossing the lower part of the chest and moving up and down during respiration, which, when present on one side, indicates air or fluid in the pleural cavity, or pneumonia. In ruptures of the diaphragm with hernia this phenomenon can be seen below the tympanitic area. There will be symptoms of obstruction if there be strangulation of the stomach or bowel. Leichtenstern claims that in only 5 out of 250 cases of diaphragmatic hernia was the diagnosis made before death. Walker[65] believes that in recent cases, if the diagnosis has been made early, laparotomy should be performed. In old cases, on account of the difficulty of reducing the gut, ligating the sac and stitching the rent in the diaphragm, the transpleural route is preferable. If after laparotomy the gut cannot be reduced a thoracotomy is justifiable.

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REVIEWS.

A System of Practical Therapeutics. By Eminent American and Foreign Authors. Edited by Hobart Amory Hare, M.D., Professor of Therapeutics, Jefferson Medical College; Physician to Jefferson College Hospital, etc., Philadelphia. New (second) edition, thoroughly revised. In three handsome octavo volumes, containing 2593 pages, with 457 engravings and 26 full-page colored plates. Philadelphia and New York: Lea Brothers & Co., 1901.

The second volume of Professor Hare's *System of Therapeutics*, which deals with the treatment of fevers, skin diseases, the respiratory, circulatory, renal, and nervous systems, is divided into twenty-nine chapters, contributed by twenty-five well-known authorities, almost all of whom are teachers of the subject on which they write. Ten of the chapters are entirely new, the rest have been overhauled and carefully amended. It is written from a bedside stand-point, in lucid terms, which, though not dogmatic, are sufficiently positive and convincing to guide rather than direct. It is a work calculated to make the reader think; it contains exercises for his judgment; a drug is not recommended for a symptom, but the cause of complaint is diligently sought, removed if possible, and the effect is combated with an eye to the individual as well as to the disease. An effort is made to inculcate rational instead of routine treatment, to smooth ruts with reason, and to append to each recipe brains *quantum sufficit*. Hare well says that "the curse of therapeutics is the fact that physicians do not think for themselves, but blindly follow some method." Archaic procedures and untried novelties, with a few justifiable exceptions, are excluded.

Typhoid fever, pneumonia, and intestinal parasites are treated by the editor. He says of enteric fever that meddlesome therapeutics designed to abort or jugulate the disease is not only fallacious but baneful in practice; that the patient should be allowed to get well; that antityphoidal inoculations are practically futile; that the urine contains bacilli and should be disinfected, and that the diet should be more liberal. He controls fever with cold: sponging some, rubbing some with ice, and using the plunge-bath in others. He prays against the routine bath treatment, quoting Osler: "When I hear a poor fellow (who has been dumped, like Falstaff, hissing hot into a cool tub) chattering out maledictions upon nurses and doctor I am inclined to resent it and to pray for a method which may be, while equally life-saving, to put it mildly, less disagreeable." He quotes Keen on perforation, and hopes that diagnosis may so far advance that enterorrhagia may be arrested by abdominal section.

In addition to the remedies given for hiccough the reviewer has got gratifying results from strapping the diaphragm—*i. e.*, adjusting broad strips of adhesive plaster around the lower chest and upper abdomen

to limit the spasm. We are sorry the complications are not dealt with more fully, as there is a sense of incompleteness when the end of the dissertation is reached.

Of pneumonia he writes that the value of oxygen is problematical; that antipneumotoxin is in the experimental stage and does not give results which would justify its use; that persons whose lungs are impaired in vital resistance should be forbidden to enter the room of a person suffering from this disease, and that the sputum should be carefully disinfected. A short time since we had the opportunity to observe a wife's devotion to a husband afflicted with pneumonia rewarded by a frank attack of pneumonitis; this is but one case, but it has left an impression.

Under the individual prophylaxis of malaria, by James M. Anders, we are advised to avoid night air, to sleep above the ground-floor of a dwelling, and to boil our drinking-water, but we find no reference to the anopheles or to mosquito-netting.

William M. Welsh describes the management of variola in the manner expected from so eminent an authority. In common with most therapeutists the author maintains that scarring can be prevented only by aborting the rash, and that of all the ectrotic measures advocated none is of any value, and many are distinctly harmful.

In treating varicella, rubeola, rubella, and scarlatina J. P. Crozer Griffith holds that every effort should be made to prevent other children contracting the disease, and that the physician should wear during his visit linen or rubber overclothing, should disinfect his face and hands before leaving the anteroom, and should not go directly from the house to those of other patients. This advice is sound but seldom practicable, and we fear our brothers will little heed it.

In discussing yellow fever D. T. Lainé states that it can be treated in a room without communicating the disease to non-immunes. He believes the infection is conveyed by means of emanations other than gaseous, the environs being infected and capable of producing yellow fever in others, but that it takes some days before the environment is thus capable of inducing the disease. The bacillus icteroides is asserted to be far from being accepted as the true germ of yellow fever. Sanarelli's serum appears to be of very doubtful value; the use of blood-serum of recent immunes, however, seems to have assumed a more favorable position. We should like to feel pretty sure of our benefactor before allowing his serum to traverse our veins. The cold bath is recommended for high fever and is contraindicated in the old, the very young, and the feeble. The culex fasciatus is ignored, perhaps because the book was in press before the conclusion reached by Reed, Carroll, Agramonte, and Lazear, that the mosquito serves as the intermediate host for the parasite of yellow fever, was published. Osler, however, says this conclusion is too positive from such scanty data.

The paper by Frederick A. Packard on tonsillitis, influenza, and acute articular rheumatism is written with the thoroughness and freshness characteristic of the author. He favors the view that rheumatism is an infection which frequently enters at the throat; that the salicyl compounds are specifics—shortening the duration of the attack, mitigating its severity, and lessening the complications.

Floyd M. Crandall details the treatment of diphtheria, spasmodic croup, rickets, mumps, and diseases of the mucous membrane of the

mouth. He argues that the antitoxin treatment has passed from the realm of discussion to that of certainty, and advocates its use in every suspected case without waiting for a positive diagnosis. "The list of drugs in the pharmacopœia is long. For all it is claimed that they are of value in the treatment of one and the other of the ills to which our flesh is heir, yet few of even the most useful have been subjected to the same fierce criticism as has the antitoxin of diphtheria and still fewer have borne the ordeal as triumphantly." Post-diphtheritic laryngeal stenosis, admittedly rare, is absent both from the text and index.

Organic diseases of the heart is presented by W. H. Thompson. The Schott treatment within limits is fully indorsed. One does not get an adequate idea as to just what the Oertel treatment is. We are sure surgeons would take exception to treating suppurative pericarditis by tapping.

The value of the sections on gastric diseases by Thomas G. Ashton, and kidney diseases by N. S. Davis, Jr., would be greatly enhanced by an elaboration of the surgical therapeutics of these organs. The general practitioner wants to know what to do when drugs fail to control hæmatemesis, when lavage fails to cure gastrectasia, and when ulcer ventriculi resists all medical measures. We regret that early resort to exploratory laparotomy is not emphasized and urged in gastric cancer suspects, as it is the only hope, and not a forlorn hope, as many think; carcinoma of the stomach can be and has been cured by early excision.

There is an excellent exposition of the treatment of apoplexy, brain and spinal tumors, meningitis, cerebritis, and neuritis by Charles K. Mills. He refers to Dawbarn's method of treating cerebral apoplexy by sequestrating a large portion of blood in the limbs by means of the Spanish windlass, thus diminishing blood-pressure at the bleeding-point and favoring hæmostasis. In discussing the surgery of brain tumors he says: "Absolutely inviolable, then, are only the middle region of the base and its bordering convolutions—the corpora quadrigemina and the pons oblongata;" and writes concerning spinal tumors that antisyphilitic measures and operation are our only curative resources; the latter formerly dismissed as chimerical, absurd, or even cruel, now has an advocacy based upon at least a few striking successes; and gives space to Lamphear's operation for tubercular meningitis, which consists in opening and irrigating the meningeal cavity as the belly is flushed in tubercular peritonitis. Keen and Senn believe this procedure justifiable.

Wharton Sinkler gives an able disquisition on headaches and neuralgia, to which he appends a list of 127 remedies for these distressing symptoms. Trephining for inveterate headache, although mentioned in the text, is not included in this list.

The therapeutics of the liver and spleen, by John H. Musser, is well up to date and thoroughly practical; we note, however, the absence of calcium chloride in the treatment of the hemorrhage of jaundice.

The remaining contributions to this volume are: Dengue, by J. W. McLaughlin, who gives the micrococcus of dengue as the probable cause of this disease; Diseases of the Bloodvessels, by Frederick C. Shattuck, who fails to mention Meigs on endophlebitis; Nervous Diseases of the Heart, a highly interesting and instructive chapter by Sir Lauder Brunton, the only foreign contributor to this volume; Disorders of Sleep, an admirable article, by Hugh T. Patrick; Asthma,

Bronchitis, and Whooping-cough, by Norman Bridge; Diarrhœal Diseases and Dysentery, by W. W. Johnson; Drug Habits, by F. X. Dercum; Locomotor Ataxia, Acute Infantile Spinal Paralysis, Myelitis, and Amyotrophic Lateral Sclerosis, by M. Allen Starr; Spasmodic Affections of the Nervous System, by Joseph Collins; Medical Treatment of Insanity, by H. M. Bannister; Hospital Treatment of Insanity, by Edward N. Brush; and the Modern Treatment of Diseases of the Skin, by Henry W. Stelwagon.

In looking over this book we are struck with absence of references in many portions and by the fact that there are only two prescriptions with eight and only one with nine ingredients; this in itself speaks eloquently for the volume.

We may sincerely commend this work to the profession, believing it to be eminently practical, flush with the times, and thorough, and because its text is interwoven with an "inordinate amount of common sense." F. T. S.

Recent Obstetric Literature.

Human Placentation. By J. Clarence Webster, B.A., M.D. With 233 illustrations. Pp. 126. Chicago: W. T. Keener & Co., 1901.

In the book under consideration the author gives the results of investigations covering a period of several years, accompanied by a bibliography.

He first considers the structure of the mucous membrane of the body of the uterus before impregnation, and then passes to a description of the decidua. He gives a synopsis of the descriptions published of the earliest embryos, especially that of Peters, of Leopold, and of Reichert. His observations agree in the main with Peters' description. He believes that pregnancy brings about a marked hypertrophy of pre-existing embryonic cellular elements. Actual cell division can be distinguished in parts. He repudiates absolutely other views of this process, and pays his respects to the authors of these views by saying that their opinions must be entirely abandoned. He calls attention to the interesting fact that in the great mass of mammalians menstruation does not occur, but the fertilized ovum grows upon the normal unaltered mucosa. It is to be regretted that the author adheres to the terms "reflexa," "serotina," and "vera" in describing the decidua. His statements would be clearer if he would adopt the usage naming the decidua uterine, placental, or ovular. He thinks that the ovular decidua or reflexa has for its function to fix and steady the ovum during its early life while the placenta is being established. Its gradual disappearance is in harmony with this view.

In treating of the placental decidua or serotina, the syncytium comes up for consideration. He finds that in the uterine decidua or vera in the sixth week there is no trace of syncytium, when the latter is abundantly present on the placental decidua or serotina. The progressive changes in the decidua he ascribes largely to pressure of the uterine contents caused by the growing ovum. The epithelium on the surface degenerates and disappears, probably because of some influence of the fœtal epiblast. The theory of fatty degeneration he rejects.

As regards the relations of the ovum to the decidua, in the earliest pregnancy yet described the chorionic vesicle is embedded in the substance of the compact layer of the uterine mucosa, the epiblast forming a thick layer of trophoblast broken up by vacuoles and spaces. Syncytium is already forming where the cells are in contact with maternal blood. Villi develop as buds of fœtal epiblast. The statement of Duval is quoted, that the placenta in its origin represents a maternal hemorrhage, circumscribed or encysted by ectodermal fœtal elements. The villi do not extend into the mouth of a sinus, but are attached to the surface of the decidua.

A detailed description of the chorion at various stages of pregnancy follows, and it is noted that the intervillous circulation is largely independent of sudden changes in the circulation of the mother. Blood moves through the villi as a steadily advancing mass.

The separation plane of the ovum is mainly through the compact layer of the placental and uterine decidua in its middle or outer layer. In incomplete abortions the entire uterine decidua or vera may be left with or without the ovular decidua and villi. In these cases the separation plane extends only through the outer layer of the placental decidua. In the latter months, when complete abortion occurs, the ovum still separates mainly through the compact layers. The same is true in the late months of pregnancy and at full term, but owing to the thinness of this layer the separation often occurs through the junction of compact and spongy layers. After the complete delivery of the ovum the uterus has still attached to its inner surface the main thickness of the decidua which was present before labor began.

The author describes the placenta when expelled, and agrees with those who have studied the nature of placental infarcts. A chapter on the phylogeny of the placenta concludes the text of the book.

The illustrations are most of them reasonably clear. Some, however, are indistinct, and some are so small that a clear idea of the matter stated is not obtained from the illustration. Microphotographs are rarely clear when reproduced in half-tone. They require redrawing or careful strengthening to bring out the points especially desired. The presswork of the book is fairly good, but is not up to the best standard. It is to be regretted that the author's labors do not meet with more worthy illustration.

His view of syncytioma malignum is that its origin is decidedly a fœtal one. E. P. D.

A Text-book on Practical Obstetrics. By Egbert H. Grandin, M.D., and George W. Jarman, M.D. Third edition. Philadelphia: The F. A. Davis Co., 1900.

This work was originally issued in two volumes, and is especially designed to inform those interested in the practice of obstetrics. It gives a clear and rational exposition of modern obstetric knowledge, and is illustrated with a considerable number of pictures of greater and less value.

In its present form the work has been put into one volume and made of very convenient size.

The authors have decided views regarding methods of treatment, and express them clearly. Their subject-matter is worthy of a better dress,

as some of the illustrations and the general appearance of the volume are not in keeping with its value. It is a useful and interesting book, and one which deserves its popularity with the profession.

THE OBSTETRIC CLINIC. By DENSLOW LEWIS, P.H.C., M.D. Chicago: E. H. Colegrove, 1900.

IN this volume the writer publishes from stenographic reports a series of clinical lectures upon obstetrics given at the Cook County Hospital, Chicago. In many branches of obstetrics his material has been ample, and he has presented a number of interesting cases. Much of the volume is in accord with recent knowledge upon the subject. The matter is published in a very cheap form, and does not reflect especial credit upon the mechanical maker of the book.

A MANUAL OF OBSTETRICAL TECHNIQUE. By JOSEPH BROWN COOKE, M.D. Philadelphia: J. B. Lippincott Co., 1900.

IN this little volume Dr. Cooke describes briefly the technique of modern obstetric practice, with especial reference to the practice of asepsis and antisepsis. Lists are given of needed supplies; printed blanks are reproduced for the definite information of the reader. The illustrations are from photographs, and are clear and good. The book will be useful to students and physicians. E. P. D.

UTERINE FIBROMYOMATA, THEIR PATHOLOGY, DIAGNOSIS, AND TREATMENT. By E. STANMORE BISHOP, F.R.C.S. Eng., President Manchester Clinical Society; Fellow of the British Gynecological Society; Honorary Surgeon Amcoats Hospital, Manchester, etc. With 49 illustrations. Philadelphia: P. Blakiston's Son & Co., 1901.

THIS is, perhaps, the best treatise on uterine fibroids which has yet appeared. It is a beautifully printed and illustrated book of 314 pages, most of the illustrations being full-page plates and many of them modified from Kelly.

In operative gynecology the teaching is thoroughly up to date, and reflects the latest thought of the world's greatest workers in this field. The text is divided into twelve chapters, in which the subject is considered under the following heads: I., Introduction; II., Anatomical Considerations; III., Symptomatology and Diagnosis; IV., Development; V., Secondary Changes; VI., The Rôle of Medicine; VII., The Rôle of Electricity; VIII., General Survey of Surgical Treatment; IX., Preparation for Operation; X., Technique of Operative Methods; XI., Post-operative Treatment; XII., Final Results. The best chapters are undoubtedly the second, third, fourth, and fifth. That on Development is to be particularly commended for the clear and interesting manner in which this difficult phase of the subject is handled. The fact that medical, electrical, and palliative measures are of but little or no avail in these cases is shown in the chapters on the Rôle of Medicine and of Electricity. This, and the advisability of early opera-

tion in the majority of these cases, is a thought which pervades the entire book.

In the chapter on the Technique of Operative Methods much stress is laid upon old and obsolete operations, but in a treatise of this kind, which must necessarily be somewhat historical, perhaps this is essential.

The author believes in early operation in these cases, and while admitting that cases which give rise to no symptoms are best let alone, and that a heavy responsibility rests upon one who advises resort to such operations as hysterectomy, he says that there is danger that we may forget the far greater responsibility which rests upon those who counsel delay until any operation which earlier might have been a simple and safe affair has become in consequence of their advice a most dangerous and risky proceeding, undertaken, indeed, as the only alternative to certain death or constant misery. J. B. S.

PROGRESSIVE MEDICINE. A Quarterly Digest of Advances, Discoveries, and Improvements in the Medical and Surgical Sciences. Edited by HOBART AMORY HARE, M.D., assisted by H. R. M. LANDIS, M.D. Volume II., June, 1901. Surgery of the Abdomen, including Hernia. Gynecology. Diseases of the Blood. Diseases of the Glandular and Lymphatic System. Metabolic Diseases. Ophthalmology. Volume III., September, 1901. Diseases of the Thorax and its Viscera, including the Heart, Lungs, and Bloodvessels. Dermatology and Syphilis. Diseases of the Nervous System. Obstetrics. Philadelphia and New York: Lea Brothers & Co., 1901.

THE second volume of *Progressive Medicine* for 1901 contains some most important contributions to that valuable publication. Dr. William B. Coley's section on the Surgery of the Abdomen, including Hernia, is a most complete résumé of the wonderful advances made in this ever-widening sphere of surgical activity. What adds especial value to the article is the frank expression of the author's own views on the various topics under discussion. Dr. Coley is foremost among the abdominal surgeons of the United States, and writes with authority on the subject. He has inserted numerous illustrations which elucidate most clearly the obscure points in the surgery of a region of which it is so necessary that a clear picture should be borne in mind. The discussion of the radical cure of hernia is very fully entered upon, and the increasingly favorable results of operations performed by the Bassini method or some of its modifications are advanced and contrasted with the unsatisfactory and unscientific methods of treatment by injection and other non-operative measures. Dr. Clark's discussion of Gynecology comes in as a valuable supplement to the article by Dr. Coley. Particularly interesting will be found the consideration of the origin of malignant growths, spinal anæsthesia in gynecological work, and last, but by no means least, the report of the author's own epoch-making researches on the origin, development, and degeneration of the bloodvessels of the human ovary, with his mechanical theory as to the production of the menopause. In view of recent developments in the study of the various pathological changes which affect the blood, Dr. Stengel's article upon the subject possesses great value. In no branch

of medicine is more laboratory work or of a better character being done than in this, and it is a matter for congratulation that the subject is here presented in such a manner as to render it available to all physicians. Dr. Edward Jackson, in the section on Ophthalmology, discusses with especial length diseases of the conjunctiva and external apparatus of the eye. Considerable space is devoted to the description of the various toxic amblyopias about which there is at present so much discussion. He mentions cases of toxic amblyopia due to tea-drinking and to illuminating gas, and adds several further reports of cases due to the use of Jamaica ginger.

The volume for September, 1901, begins with Dr. Ewart's article on Diseases of the Thoracic Viscera and Bloodvessels. As might be expected, the largest amount of space is devoted to pulmonary tuberculosis, although influenza and pneumonia are fully entered upon. The author describes very minutely the treatment of diseases of the heart and bloodvessels by means of various baths, such as the Nauheim and the modifications of the Schott exercises. In the section on Dermatology and Syphilis, Dr. Gottheil's article will be found especially useful in its discussion of the differential diagnosis of skin lesions and in its able presentation of the new forms of treatment by phototherapy and radiotherapy. The many excellent illustrations which accompany this article are of great value. Dr. William G. Spiller's contribution on Diseases of the Brain and Nervous System will be read with much interest because of the clear and interesting manner in which the author considers the diagnosis of cerebral tumors and abscesses, and of the obscure lesions of the spinal cord. There are no classes of cases more difficult to the general practitioner than these, and Dr. Spiller's article will prove a very helpful one. In Obstetrics, Dr. Richard C. Norris remarks that the literature of the current year has not been characterized by the production of any papers of an epoch-making character; nevertheless, many contributions of great interest have been written, and from these he selects for especial notice those which deal with the subject of eclampsia and its treatment by saline infusions, and the papers dealing with anæsthesia during labor.

In our review we have necessarily confined ourselves to picking out those topics from the various papers which we considered particularly worthy of mention, but in each section it will be found that not only are these main subjects discussed, but collateral subjects are fully treated of also. To the specialist as well as to the practitioner such a series of articles is of inestimable value. J. M. S.

MILITARY HYGIENE. By EDWARD L. MUNSON, A.M., M.D., Captain Medical Department U. S. Army. New York: William Wood & Co.

IT is established that armies suffer much less from wounds and deaths incurred in action than from disease. The necessity, then, for a complete and accurate knowledge of military hygiene cannot be gainsaid. Heretofore such knowledge has been meagre, incomplete, and widely scattered. Dr. Munson has incorporated in his one volume all that a military surgeon is required to know of hygiene in its broadest sense.

Taking the recruit as the unit of the army, as the point of attack

for all diseases, injuries, and illnesses, as the cause for all hygienic, dietetic, sociologic, and prophylactic means and methods, the author consumes almost a thousand pages in their consideration. The work is so complete that collateral reading is unnecessary.

The book consists of thirty-one chapters, each a complete treatise on a special subdivision of the general head. The treatment of each subject gives evidence of access to vast stores of statistics, practical knowledge, and experience. The conclusions are given tersely, and are often the well-earned result of eliminative personal experience. The lessons of the late Spanish-American war have been well learned, and if the author's advice is followed need not be repeated. The book is unusually well balanced, each subject receiving its merited attention. The methods advocated for maintaining the efficiency of the soldier, guarding him from sickness or disease, and rendering him a contented being, are easily employed and eminently effective. From its size the book will not often reach beyond the medical department, yet some of the chapters should be in the hands of every officer, medical or otherwise.

The Commissary Department would find interesting reading in the chapter on "The Ration." To the quartermaster we would refer the chapters on "Military Clothing and Equipment," "Camp Sites and Camps," "Post Barracks and Quarters." The chaplain would find interesting material in "The Habits of the Soldier as Affecting His Efficiency." The canteen is discussed at length, and in its best form commended. The commander and subaltern would greatly benefit by studying "The March in Campaign" and "The Development of the Recruit." The truth, forcibly told, in regard to the results of alcoholic and venereal excess might be of benefit if readily accessible in pamphlet form to the wayward private.

There is so much that is easy and practical of application, with results that would be beneficial both to the State militia and the regular establishment, that it is impossible to choose for special mention. The author's method of rendering the uniform water-proof is a suggestion that merits attention from a number of view-points. In this way the equipment could be lightened, the length of the march prolonged, and much physical discomfort avoided.

From the "Selection of the Recruit" to the end there is not a weak chapter in the book. The illustrations are well selected and executed, the index is complete, the print, as, in fact, the entire workmanship of the book, all that could be desired. W. H. K.

THE CHILD, HIS NATURE AND NURTURE. By W. B. DRUMMOND, M.B., C.M., M.R.C.P.C., Physician to the Western Dispensary, Edinburgh. New York: The Macmillan Co.

THIS little book, one of the Temple Primer Series, is intended, as the author states in his preface, merely as an introduction to the subject of the physical and mental development of the child. While the book is very limited in its scope and elementary in character, it serves the purpose well, and as a preparation for more pretentious works on child study, is well worth reading by anyone interested in the subject.

G. M. C.

PROGRESS

OF

MEDICAL SCIENCE.

MEDICINE.

UNDER THE CHARGE OF

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Typhoid Fever at the Royal Victoria Hospital.—PROF. STEWART (*British Medical Journal*, 1901, i., 1463) reports the results of the treatment of 620 cases of typhoid fever occurring during seven years ending December 31, 1900. The mortality for these years was 5.4 per cent. The comparison of the annual percentages of mortality based upon from 72 to 126 cases a year is a striking demonstration of the uselessness of any attempt to draw conclusions as to treatment in such a malady as typhoid fever from anything but really large numbers of cases. These percentages vary from 0 to 9.3. In 10 per cent. of the cases the onset was associated with rigors or chills during the first week; 32.25 per cent. of the deaths occurred from perforation; 29.41 from a general intoxication; 26.47 from hemorrhage.

Out of the 11 cases of perforation an operation was attempted in 8 without a successful result.

Stewart makes the observation that "a simple (non-perforative) peritonitis is not an uncommon event in typhoid fever, and may clinically closely resemble a perforative peritonitis. Recently we have had such an experience." In this case, in which, however, the condition of the peritoneum is not described, an exploratory operation was made from which the patient made a good recovery.

While leucocytosis was the rule it was entirely absent in some instances of perforation. It may also be present in conditions the other symptoms of which simulate perforation. It is believed "that with pain and tenderness in the abdomen coming on suddenly during an attack of typhoid fever (and in absence of other definite complications) a distinct leucocytosis, even

without other signs of perforation, an exploratory operation is justified, even advisable, thereby obviating the dangers of a fatal issue from too great a delay."

In cases of hemorrhage the following measures are employed:

1. The patient is urged to keep as quiet as possible.
2. The foot of the bed is elevated.
3. Cold is applied to the abdomen by means of a Leiter aluminium coil.
4. Opium is given internally.
5. Food by the stomach is either greatly lessened or entirely stopped.

Neither ergot nor acetate of lead has been employed.

Seven cases of cholecystitis were met with; in one instance in which there was a pericholecystitis as well the result was fatal.

Relapses occurred in 9 per cent. of the cases.

Of 370 cases the Widal test was positive in all but 8. In 3 of these latter cases the course of the disease was very mild, terminating in the second week. In 2 instances the reaction was present as early as the third day; in 4 on the fourth day. Out of 96 cases the reaction was positive on the day of discharge in all but 6. In 4 cases after a period of six months the reaction was positive with a dilution of 1 : 20, and in 7 the reaction was positive with the same dilution after a year; in six cases the reaction was positive after two years, and in 2 cases after three years. In 10 cases discharged a year previously reaction was negative. In 4 cases after two years and in 4 cases after three years it was also absent.

The striking case of typhoid fever without intestinal lesions, reported by Nichols and Keenan (*Montreal Medical Journal*, vol. xxvii., 9), is again discussed.

In all these hydrotherapy has been the routine treatment. The first bath is administered after a temperature cooled from 90° to 80° for ten minutes; the second at a temperature from 85° to 75° for a similar period, and the third at the same temperature for fifteen minutes; the fourth and subsequent baths are given at 80°, quickly lowered to 70° for a period of fifteen minutes. The usual precautions are taken as to friction, etc. The bath is repeated every third hour while the temperature remains above 102.4°.

About 83 per cent. of the cases were bathed throughout the course of the disease. Of the 17 per cent. who were not bathed, some few were patients who rebelled against the treatment; in about 5 per cent. the temperature never reached the bathing point; in about 1 per cent. the reaction was so bad that the continuance of the treatment was deemed inadvisable, while a few cases admitted as late as the third week of the disease were not bathed. Severe abdominal complications, such as hemorrhage, perforation, cholecystitis, and intense nephritis, necessitated the discontinuance of the baths.

SURGERY.

UNDER THE CHARGE OF

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What I Have Learned from One Hundred and Sixty-one Operations for the Relief of Senile Hypertrophy of the Prostate Gland.—HORWITZ (*Philadelphia Medical Journal*, June 22, 1901) states in conclusion: 1. Success following the Bottini operation depends on having perfect instruments, a good battery, the necessary skill, and the employment of a proper technique. 2. In suitable cases the Bottini is the safest and best radical operation thus far advised for the relief of prostatic hypertrophy. 3. It is often very efficacious in advanced cases of obstruction as a palliative measure, rendering catheterism easy and painless, relieving spasm, lessening the tendency to constipation, and improving the general health. 4. It is of especial service in the beginning of obstructive symptoms due to hypertrophy of the prostate gland, and may be regarded as a means of preventing catheter life. 5. It is indicated in all forms of hypertrophy except where there is a valvular formation, or where there is an enormous overgrowth of the three lobes, associated with tumor formation giving rise to a pouch, both above and below the prostate gland. 6. Where the bladder is hopelessly damaged, together with a general atheromatous condition of the bloodvessels, associated with polyuria, results are negative. 7. Pyelitis is not a contraindication to resort to operation. 8. The character of the prostatic growth has no bearing on the results of the operation. The ligation of the internal iliac arteries for the relief of hypertrophy of the prostate gland, first recommended by Bier, has been tried by several surgeons with very unfavorable results. The benefit derived from the operation is slight, and the mortality higher than that following prostatectomy. Thus far the results derived from angioneurectomy have been negative. The author has frequently witnessed the operation of perineal prostatectomy when performed by others, and has on various occasions resorted to it, but he has found that nothing was gained beyond the temporary improvement that might naturally be expected to follow rest and drainage. These methods have, therefore, not been employed in the cases referred to in this paper.

Amputation Through the Hip-joint, with a Synopsis of Two Hundred and Sixty-seven Cases in which the Author's Method was Employed.—WYETH (*Journal of the American Medical Association*, May 18, 1901) states that the 267 cases may be classified into three groups: 1. Neoplasms,

including sarcoma, carcinoma, epithelioma, and one case of elephantiasis, and probably one osteoma. 2. Septic infections, including pyogenic osteitis or osteomyelitis, tuberculous osteitis or osteoarthritis, gangrene, cellulitis, and ulcer. 3. Injuries, with or without pyogenic infection.

In the group of amputations at the hip for neoplasms, all of which were malignant in character—with the exception of one case of elephantiasis and one of osteoma—there were 131 cases of sarcoma, 5 of epithelioma of the soft parts, and 1 reported as osteocarcinoma. None died in this group, excepting 14 fatal cases of the subdivision of sarcoma, giving the rate of mortality in disarticulation at the hip for sarcoma as 10.6 per cent., while for the whole group of 137 cases the death-rate was 10.2 per cent. Of the fatal cases, 1 died as the result of a severe hemorrhage immediately before the operation, which was practically hopeless when it was undertaken; 1 from tubercular peritonitis on the eleventh day; 1 from septicæmia on the twenty-sixth day; 1 from asphyxia of unknown origin on the twelfth day, and 10 died from shock after the operation.

Under the heading of septic infection, 94 hip-joint amputations were made; they are classified as follows: Pyogenic osteitis or osteomyelitis—not tuberculous—36, with 5 deaths, a mortality ratio of 14 per cent.; tuberculous osteitis or osteoarthritis 41, with 4 deaths, or 9.7 per cent.; gangrene—moist and diabetic—12, with 6 deaths, or 50 per cent.; general cellulitis 3, with 1 death, or 33⅓ per cent.; ulcer from breaking down of an extensive cutaneous surface 2, with recovery; total for septic infections, 94 cases, of which 16 died, or 17 per cent. Practically all the fatal cases were in a condition of great exhaustion due to prolonged sepsis, or they died from causes not directly referable to the operation. Of the 5 fatal cases in the first group, 1 was in such a seemingly hopeless condition that the operation was not advised. The second case was almost equally emaciated and anæmic from prolonged septic absorption. A third fatal case was complicated with a fracture which had existed for several months before the operation, while a fourth died of cerebral apoplexy on the tenth day, the cause of death not being referable to the operation.

For tuberculous osteitis and osteoarthritis—or hip-joint disease—4 out of 41 died, or 9.7 per cent. There were no serious complications in these 4 fatal cases, although they were weakened by the prolonged sepsis and waxy degenerations which are characteristic of tuberculosis in the bones. The operation was undoubtedly the immediate cause of death in each of these.

In the case of gangrene, as one would naturally suppose, the death-rate was exceedingly high, 6 of the 12 ending fatally; 1 died from shock; 1 from hemorrhage after the removal of the tourniquet; one from pneumonia; two from septicæmia, and 1 from cerebral embolism at the end of the second week after the operation; 1 case of cellulitis died out of 3 from anæmia and septicæmia. In the third group, injuries with or without septic infection, there are 36 cases with 23 deaths, a mortality ratio of 63.9 per cent. Twenty-four disarticulations at the hip were performed on account of extensive injuries to one or both lower extremities by railway trucks or heavy machinery. Of these 16 died, a mortality ratio of 66.6 per cent. When we consider the character of these injuries and the unfavorable conditions to which the patients were subjected, this high rate of mortality is not surpris-

ing. Hemorrhage more or less severe occurred in all cases, and it was difficult, and at times impossible, to overcome the shock which supervened. It is more than probable that had the intravenous injection of a saline solution been made before all of these were subjected to operation the ratio of mortality would have been decreased, since the majority of the fatal cases died in shock and before septic infection was observed.

Idiopathic Abscess of the Kidney.—CABOT (*Boston Medical and Surgical Journal*, June 6, 1901) states that abscess of the kidney may be due to (1) injury; (2) by the direct extension of inflammation from contiguous parts; (3) by the extension of an inflammation from the pelvis of the kidney into the substance of the organ; (4) infection through the blood. Suppurative inflammations induced in the kidney by organisms brought to that organ by the blood are extremely rare, excepting those abscesses due to the action of the tubercle bacilli. The author reports the case of a man, aged thirty-one years, who had an intense septic process in one kidney, which was due to a pure culture of the colon bacillus. Immediate operation being decided upon, the affected kidney was incised, the abscess evacuated, and drainage tubes introduced. Cultures taken during the operation showed the pus to contain a pure culture of the bacillus coli communis. The patient made an uninterrupted recovery. It was impossible to discover the precise manner in which the infection occurred. There was no evidence to indicate a probable primary source of infection. In the absence of any external lesion through which micro-organisms might enter the circulation, it is plain that one must suspect the alimentary canal of having afforded somewhere a weak spot through which the colon bacilli effected an entrance into the bloodvessels. When the diagnosis of an acute septic process in the kidney is established the pus should immediately be evacuated. In every case of doubt it is justifiable to explore the kidney by an incision. If an abscess is not found, but only a tense, congested kidney, an incision of the capsule along the convexity will afford, usually, great relief. If there is any question of the existence of a calculus the exploratory incision will afford opportunity for a thorough search and for the removal of the stone if one is found. If the kidney is movable and suffering from congestion or intermittent hydronephrosis, induced by the twisting of the vessels and ureter, it can be drawn up and stitched in the loin. Thus the operation offers promise of relief in each and every one of the conditions which is likely to give rise to similar symptoms. It has little or no danger attaching to it, and if an abscess is found the operation done early will stand a far better chance of cutting short the septic process than it would if it were kept as a last resort.

The Topical Treatment of Focal and Jacksonian Epilepsy.—WHITE (*University of Pennsylvania Medical Bulletin*, June, 1901) states that in cases of idiopathic epilepsy and pseudo-Jacksonian epilepsy operation is contra-indicated. In the true focal or Jacksonian cases the results of operation, while more encouraging than in the other class of cases, are not sufficiently so as to justify one in ignoring the greatly increased risk and the post-operative paralysis following excision of the epileptogenetic centre, without which the trephining becomes an incomplete and unsatisfactory operation.

The author's method is as follows: The affected centre is of course determined in advance by the most careful study and observation of the case. Its relation to the cranium is indicated by a silver or iodine mark upon the shaven scalp two days before the operation. The scalp is sterilized and resterilized three times, at intervals of twelve hours, not only before the trephining, but also before each subsequent application of the treatment. A horseshoe-shaped flap is raised, and a half-inch button of bone removed with a small trephine. The dura is left intact. Thirty minims of a sterile 2 per cent. solution of eucaine are then injected into the brain substance at the centre of the trephine opening, the point of the needle being introduced about three-quarters of an inch. The needle is gradually withdrawn as the last ten minims of the solution are injected. The flap is replaced. The patient is returned to bed, and on the day of the operation and the following day should receive full doses of bromides. At intervals, the proper length of which can only be determined by experience, the scalp having been sterilized as above, the injection is repeated. The patient should be kept in bed at least four hours after each injection, and should take bromides for from one to two days. The author reports two cases, and states that it is apparent that they cannot be said to establish even the entire safety of the procedure. In one of the cases convulsions of marked severity followed one of the injections. Neither can it be said that the results obtained were noticeably better than have seemed to follow other methods of operative procedure. It still seems, however, that there are possibilities of benefit by this line of treatment which justifies the author in placing it conservatively, as he has tried to do, before the profession.

The Results of Trendelenburg's Operation for Varicose Veins in Fifty-seven Lower Extremities.—RAMSAY (*Intercolonial Medical Journal of Australasia*, April 20, 1901) states that this operation consists simply in the division of the internal saphena vein just below the saphenous opening after the application of ligatures above and below the point of division, The author reports the results of his operations two years after they were performed. In sixteen cases the double operation was performed either at one time or subsequently. The internal saphena was ligatured in all the cases but one; in this the external saphena was ligatured with very satisfactory result. In two cases both the internal and external saphena were ligatured. The site usually chosen for the operation is an inch or two below the saphenous opening. In three of the cases the site was the middle of the thigh, with a good result in each case. In two other cases the operation was performed three or four inches above the knee, with a fairly good result. Unless the wound becomes septic, there is not much risk of embolus, but if it does there is also the added danger of pyæmia. The vein is best reached by a transvere incision, and medium-sized silk was found to be a satisfactory ligature material. In two cases the vessel was simply ligatured and not divided. The patients were generally kept in bed for a week after the operation, and allowed to walk on the tenth day. Where ulcers were present they were kept at rest until the ulcers had healed. In fourteen limbs, in addition to the Trendelenburg operation, several bunches of varices, small venous cysts, patches of fairly recent thrombosis, and superficial varices, in

places very liable to injury, were excised at the same time. In two limbs these portions were excised after the Trendelenburg operation had not improved the condition of the veins. Of the forty-one cases, eighteen were males and twenty-three females. The results were: Not traced after six weeks in 4 cases; very successful result in 24 cases; successful result in 13 cases; symptoms cured, veins persist in 2 cases; great temporary relief and finally improved in 7 cases; ulcer forms after two and two and one-half years in 2 cases; unsuccessful and ulcer unimproved in 5 cases. Roughly, it may be said that 75 per cent. are successful; 10 per cent. are unsuccessful; 15 per cent. are doubtful, but 10 per cent. of these undoubtedly are improved, and the rest are practically well for two and two and one-half years.

The Technique of Bloodless Work.—DAWBARN (*Journal of the American Medical Association*, February 9, 1901) states that every drop of blood saved is a safeguard against shock, and bloodless work permits the same speed and facility of dissection that one could employ on the dead body. The present method in general use consists in stripping, "milking," by the fingers for some minutes the blood out of the elevated limb by massaging along the course of the chief veins. Then, at the desired point, is applied the constriction, which is either an ordinary stout rubber bandage or a very large rubber tube. In consequence of the simple milking a small amount of blood remains in every vessel. These are not paralyzed, as in cases where the Esmarch bandage has been used, hence there is small tendency to oozing in the wound and the severed arteries may be located with ease. The scalp may be rendered bloodless by the use of a tube carried tightly about the head. This rests in front of the depression between the frontal eminences and the superciliary ridges, at the sides runs just above the ears and behind is fastened just below the inion. In operations on the female breast the work may be made almost bloodless by cording the breast at the body, first passing through the space crosswise a pair of long mattress needles, to ensure against the tube slipping off. In operations about the bladder or perineum the Trendelenburg posture secures by gravity a degree of anæmia which constitutes a great safeguard in addition to other advantages resulting from this position. Constricting the extremities enables one to do comparatively bloodless surgical work on the trunk, face, neck, or brain, and it is worthy of more frequent usage than at present. It is also unquestionably the best means of treating hemorrhage where direct mechanical control is out of the question, as in hæmoptysis, etc. Applying the bloodless method to the surgery of acute injuries an excellent plan is that devised by Gerster. This method is useful for the reduction of the swelling following severe traumatism, and enables the surgeon to make an accurate diagnosis in injuries to the extremities. It consists in the anæsthetization of the patient, the application of the rubber bandage slowly but firmly from the end of the limb to the trunk. This is left on for fifteen or twenty minutes, then undone from below, but the final turn or two is left in place, examination will then show the swelling to be entirely gone. The bloodless method may also be applied to tonsillotomy by passing with a semi-circular needle a purse-string suture through the base of the tonsil. Bloodless work may also be applied to starving malignant growths supplied by the external carotids.

The Treatment of Goitre.—KOCHER (*Medical Press and Circular*, May 8, 1901) states that he has performed excision in 1000 cases with the result of only four recurrences. The mortality in normal goitre has been 4 per cent., which includes one death from chloroform and one from cachexia strumipriva. No cases became infected. The dangers of the operation may be distinctly lessened by avoiding general anæsthesia and using Schleich's method of cocaine anæsthesia. As regards non-operative treatment of goitre, that by iodine still plays a useful part in spite of the highly praised and more recently introduced thyroid treatment. Iodide of potassium is to be given with caution, and the thyroid preparation even more so. The author has returned to the old treatment, and advises the use of from six to eight grammes of sodium phosphate daily. The hyposecretion of the goitre is increased by sodium phosphate, and thus diminution in size takes place.

PEDIATRICS.

UNDER THE CHARGE OF

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The Treatment of "Growing Pains" by Aspirin.—J. A. HALE (*Pediatrics*, July 15, 1901, p. 50) follows the most recent opinions as to the rheumatic nature of so-called "growing pains." He has found salicylic acid to be efficient, but often needed in doses that produce distinct toxic symptoms. Salicylate of sodium is objectionable for the same reason, but to a less degree. Both drugs are decidedly irritant to the stomach. Of the newer substitutes for these drugs aspirin has given very satisfactory results, even superior to those of salophen, which is very much better tolerated by the stomach than either salicylic acid or its sodium salt. Aspirin is produced by the action of acetic acid anhydride upon salicylic acid. It undergoes little or no change in the stomach, but is decomposed in the small intestines, liberating the salicylic acid in a nascent state, and leaving the acetic acid to combine with alkalies present to form the beneficial compounds of sodium and potassium acetate.

Stricture of the Œsophagus following Typhoid Fever.—W. O. ROBERTS, of Louisville (*Pediatrics*, July 1, 1901, p. 15), reports a case of œsophageal stricture following typhoid. According to statistics this is one of the rarest of the sequelæ of the disease, which, according to Keen's collection of 1700 cases in his monograph on *The Surgical Complications of Typhoid Fever*, has been reported only twice. The patient, a boy, aged fifteen years, had suffered from a severe attack of fever, confining him to bed for nine weeks, during which time the diet had been exclusively liquid. Just before he began to sit up, in attempting to swallow a capsule of quinine, he choked,

and had considerable difficulty in finally swallowing it. Since then up to the time of reporting he was unable to swallow any solid food. The smallest sized bougie was stopped at a point about twelve inches below the teeth.

The author states that this is the third case of post-typhoid stricture of the œsophagus that has come under his observation.

The Iodide of Arsenic in the Bronchitis of Childhood.—R. SAINT-PHILIPPE (*Revue mensuelle des Maladies de l'Enfance*, July, 1901, p. 337) refers especially to a type of bronchitis observed quite often among rhachitic or lymphatic children which he designates as emphysematous bronchitis. Apart from the usual signs of bronchitis there is marked dyspnœa, which is aggravated toward nightfall and by the slightest movement, but this is distinguishable from true asthma by the presence of dry or mucous râles. This form of bronchitis is developed usually by some infectious process aided by the diathetic predisposition. Under these conditions the bronchial catarrh induced by the infectious disease, such as diphtheria, influenza, typhoid fever, measles, whooping-cough, or bronchopneumonia, shows little tendency to resolution, and by its delay leads one to suspect the presence of tuberculosis. Most of the children affected with this tenacious bronchitis show the signs of the lymphatic or scrofulous temperament. Some are flabby, indolent, and suffer from eczematous eruptions upon the face, from blepharitis, or coryza, with hypertrophy of the upper lip—in a word, the strumous facies. Others are pale, delicate, and have scrofulous or gouty antecedents; while a third class brings a new element into play in the close relation manifested between efflorescences of the skin and bronchitis, and almost all of these suffer from dyspepsia and gastro-intestinal auto-intoxication.

In such cases the author thinks that the iodide of arsenic is especially applicable. The iodine acts beneficially upon the diathetic condition as an alterative and depurative, and locally upon the circulation and secretions of the whole respiratory tract, while the arsenic supports and stimulates the entire organism. Numerous clinical observations bear out the value of this treatment. Mixed with food this drug is easily borne and is almost tasteless. It is given preferably in water or wine during the meal, or to young children in the milk. It should not be given to children with disturbance of the stomach, lest it aggravate the trouble.

The iodide of arsenic is easily prepared provided the solution is kept cold to prevent the precipitation of hydriodic acid. The formula used is 30 centigrammes of iodide of arsenic to 30 grammes of distilled water. Of this 5 drops may be given at each meal, the dose to be increased by 1 drop morning and evening until 15 or even 20 drops at a dose are taken at each meal. This maximum dose should be continued for about a month, and then gradually decreased in inverse order to 5 drops again. After a rest of eight to ten days the course should be repeated in the same manner as before.

Acetanilid Poisoning by Absorption from External Wounds.—MANASSES (*International Medical Magazine*, 1901, vol. x., No. 5) reports two cases, one in an infant, aged six weeks, the other in a child, aged two and one-half years. The first had a dermatitis of the buttocks due to irritating passages, the skin being cracked and abraded. A powder containing equal parts of

acetanilid and subgallate of bismuth was dusted over this surface. Within the next twenty-four hours the child developed subnormal temperature, cyanosis, and other symptoms of acetanilid poisoning. Recovery followed the use of hot baths with whiskey internally.

In the second case the same dusting powder was used for a scald of the buttocks. The local effects were very satisfactory, but on the second day the child complained of coldness, and the lips, ears, and finger-tips were cyanotic. These symptoms lasted for two days, gradually disappearing under the administration of a mixture of strychnine, ammonia, and brandy.

The Coincidence of Rheumatic Endocarditis with a Congenital Heart Lesion.—HALLÉ and ARMAND-DELILLE (*Archives de Médecine des Enfants*, 1901, vol. iv., No. 5) report the case of a boy, aged three years, who had always been healthy before the attack of acute articular rheumatism involving ankles and elbows. Attention was drawn to the heart by the rapidity and intensity of its action. At the apex was heard a systolic murmur, transmitted to the back. The area of cardiac dulness extended to the right border of the sternum; the lungs were normal. Death occurred in the third week from cardiac failure after several hours of severe progressive dyspnœa and cyanosis. At the autopsy the heart was found to weigh 180 grammes; the mitral valve was much thickened and presented fresh vegetations, and the foramen ovale was patulous and as large as a one-franc piece.

The case is remarkable for the previous absence of cyanosis or any functional disturbance due to the congenital defect, and for the rapidity with which the terminal symptoms ensued. The case illustrates the rule recently formulated by Marfan: whenever an acquired endocarditis in childhood presents very grave symptoms it is necessary to suspect that it does not exist alone, but is accompanied either by pericarditis or a congenital anomaly of the heart.

The Feeding of Diphtheria Cases.—R. G. KIRTON (*The Lancet*, June 15, 1901, p. 1666) emphasizes the great importance of feeding in this disease, a task that is often attended with the greatest difficulty owing to the inability of many patients to take or retain nourishment by the mouth. Feeding may be carried out by (1) the mouth; (2) the nasal tube; (3) the rectum, and (4) subcutaneous injections. In all cases, when practicable, food should be given by the mouth. Certain conditions, however, render mouth feeding impossible or inadvisable. Chief among these are the following: (1) Inability to swallow owing to pain or faucial swelling; (2) some cases of regurgitation; (3) entrance of food into the larynx in spite of slow and careful feeding, indicated by the patient's coughing when fed; (4) in certain cases, owing to struggling, the time taken and the exhaustion consequent upon the mouth feeding; and (5) continued vomiting—(*a*) vomiting which may be present almost from the onset of the disease; (*b*) early vomiting, commencing about the middle or end of the second week; and (*c*) late vomiting, which occurs after some weeks. It is well to remember that cases occur in which patients can be fed with a nasal tube without vomiting, although they vomit when fed by the mouth.

Nasal feeding can be performed with a soft rubber tube, but occasionally a stiff tube is necessary. Generally an interval of four hours is advisable, but

this must depend to a certain extent upon the individual case. Milk peptonized, if necessary, or combined with a cereal food should be the chief ingredient. Raw meat juice, eggs, cream, brandy, or medicine may be added. The quantity must vary with the age, size, etc., of the patient. About four ounces is often as much as a child of from three to five years old will be able to retain and absorb, and even this may need to be reduced. All food should be strained, measured, and given warm. If vomiting occur it may be due to the amount or contents of the meal or to the frequency of administration. If after various changes the vomiting persists, rectal alimentation must be resorted to. It is worth noting that after the first few trials nasal feeding becomes as a rule remarkably easy, owing to the effect of habit, and in some cases to actual loss of sensation.

Rectal alimentation should be resorted to when feeding by the mouth or nose fails or is insufficient. A funnel and a soft rubber tube passed as far up the rectum as possible is preferable to the bali syringe, and the fluid should be allowed to flow in by the force of gravity alone. The food should be given warm about every four hours, and should be preceded about an hour by a feeding of three or four ounces of warm water given in the same manner as the milk feeding. [Physiological salt solution is to be preferred to plain water for this purpose, as it is less irritating to the mucous membrane of the bowel.—ED.] The bowel should be irrigated every twenty-four hours, and it is possible from this to get some idea as to whether the food has been absorbed. The quantity of food thus introduced should depend upon the age of the patient. In young children it varies from two to four ounces. Peptonized milk is the basis of the feeding, and often is the only constituent. Raw meat juice, white of eggs, and occasionally yolk of eggs may be added. In some cases brandy may be added to the milk, and can be tolerated usually for a long-continued period. It may, however, provoke a diarrhœa, and thus may be better tolerated if given apart from the feeding and diluted only with water. Large rectal feedings are inadvisable, since from their bulk they are not long retained and are more apt to set up diarrhœa than the smaller quantities. Diarrhœa is a troublesome and serious complication in these cases, for rectal alimentation has to be depended upon to support life over far longer periods than is usually supposed possible. If the feedings are not retained or only retained in part, their amount should be diminished, their frequency lessened, or some ingredient of the mixture, *e. g.*, brandy, omitted. Sometimes washing out of the bowel and giving it a rest for a time is useful, or starch and laudanum enemata may be required.

In addition to the forms of feeding described the subcutaneous injection of sterile horse serum is to be recommended. This serum should be used when the amount of nourishment taken by the stomach or rectum, or both, appears to be insufficient to support life. Sometimes it offers the only means of feeding the patient, owing to continued vomiting and diarrhœa. If given over a prolonged period, 20 to 40 c.cm. are often as much as it is advisable to inject daily. The only possible indication against the use of these injections is hemorrhage into the subcutaneous tissue adjoining the site of injection. The author, however, has observed no dangerous effects from its use, either from these hemorrhages or other causes.

THERAPEUTICS.

UNDER THE CHARGE OF

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Fate of Antipyrin in the Body.—DR. D. LAWROW finds that antipyrin appears in the urine in the form of a double glycuronic acid, in which antipyrin itself is probably held in the form of an oxy-antipyrin.—*Zeitschrift für physiologie Chemie*, 1901, vol. xxxii. p. 111.

Poisoning by Aspidium.—DR. W. GOTTHILF was called to a patient and found him in deep coma, which had been preceded for two days by headache, vertigo, apathy, and complete anorexia. The diagnosis at first sight seemed to rest between epilepsy and apoplexy. A hasty examination showed a rapid, regular, but thready pulse, wide pupils, increased patellar reflexes, and a tonic spasm of the entire body, especially of the arms. The rapid reaction on stimulation made it more and more likely that the case was one of intoxication. It was then found that the patient had swallowed about two and one-half drachms of pure extract of male fern for an alleged tapeworm without subsequent catharsis. The author dwells upon the importance of removing the drug with castor oil, etc., to prevent absorption and subsequent poisoning, as in this case.—*Münchener medicinische Wochenschrift*, 1901, vol. xlviii., S. 1096.

[On the contrary, castor oil has been used in so many of the fatal cases that some other cathartic should be recommended.—R. W. W.]

Lead-poisoning from Diachylon Pills.—DR. W. WRANGHAM reports a series of five cases of lead-poisoning occurring in women who had taken diachylon pills for the purpose of inducing abortion. In all the cases the nervous system was most markedly affected, although gastro-intestinal symptoms and abdominal pains were also present. Ocular symptoms were particularly noteworthy, four of the patients presenting optic neuritis and ocular paralysis. The onset of optic neuritis is to be regarded with apprehension, as it usually presages grave mental symptoms, convulsions, delirium, and probably death. The ocular palsies included ophthalmoplegias, paralysis of the sixth nerve on the right and on both sides. It would appear from these cases that the sixth nerve is less resistant to the action of lead than other of the cranial nerves. Inasmuch as the practice of using these pills as abortifacients is wide-spread in England, at least, the author recommends the notification of all cases of lead-poisoning in women.—*British Medical Journal*, 1901, No. 2115, p. 72.

Ocular Symptoms of Lead-poisoning.—The eyes may be affected in lead-poisoning in four different ways, according to F. PINCUS: (1) There may be sudden blindness, with or without retained perception of light. The pupillary reaction, as a rule, remains positive; there is no lesion to be discovered with the ophthalmoscope, and sight returns to normal after a few days. (2) Gradually increasing amblyopia with free or constricted field of vision, or central scotoma, may occur, due to a retrobulbar optic neuritis. (3) Occasionally well-developed neuritis or papillitis, with unfavorable prognosis, is seen; and, lastly, (4) the complicating nephritis may give its symptoms. Perhaps the transitory amaurosis is most interesting of all these, since its pathology is so little understood, it being undecided whether dependent on a cortical process or upon a hydrops of the optic nerve tissues.—*Münchener medicinische Wochenschrift*, 1901, No. 33, S. 1316.

Chronic Brass-poisoning.—DR. WILLIAM MURRAY says that this type of industrial poisoning is probably on the increase, and inasmuch as it is a very illusory affection it is worth while to describe it in detail. The main symptoms are ushered in, as a rule, by an anæmia of the oligemic type, with malaise, headache, and extreme weakness and nervousness. As the disease progresses the complexion becomes sallow, the subcutaneous fat disappears, until extreme emaciation is the rule. There is loss of strength, muscular tremors, myalgic and neuralgic pains, anorexia, and gastralgia. The tongue is furred, moist, and tremulous, and the bowels irregular. There is a metallic taste in the mouth, and the breath has a metallic odor. Catarrh of the air-passages is common. Aphonia, dryness, a tickling cough, expectoration, or even hæmoptysis may be present. Nervousness, faintness, profuse sweats, and cold sensations are very troublesome features. There is a green line at the base of the gums. At times the perspiration assumes a greenish hue, and the hair even may have a peculiar tint. The disease has a marked resemblance to some types of tuberculosis; the characteristic lung signs are, however, absent. With reference to the treatment, the author advises phosphorus or phosphoric acid. The former may be given in doses as high as one-thirtieth of a grain.—*British Medical Journal*, 1901, No. 2120, p. 405.

OBSTETRICS.

UNDER THE CHARGE OF

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Traumatism Favoring the Occurrence of Ectopic Gestation.—SEELIGMANN (*Deutsch. medicinische Wochenschrift*, 1901, No. 26) reports five cases in which he has traced a clear relationship between traumatism and the occurrence of ectopic gestation. The form of traumatism consisted in a fall or

sudden jar, the patient falling backward and striking upon the ischia. In most cases pregnancy was not suspected at the time of the accident, but must have been present. Supposing impregnation to have occurred in the tube, it would be possible for such an injury to prevent the normal passage of the ovum, and thus favor the occurrence of ectopic gestation. These cases came to operation, so that no doubt can exist regarding the condition actually present.

Bipolar Version.—In the *American Gynecological and Obstetrical Journal*, July, 1901, FRY publishes a paper upon this subject. His cases were 14 in number, 50 per cent. of them primiparæ. Bipolar version and slow extraction was employed in 9. In 1 the application of forceps to the after-coming head followed bipolar version. All of the mothers recovered, and 5 out of the 13 infants were born alive. Two infants, twins, were not viable; 1 was at the seventh month, and 4 were dead when the case came under observation. Three infants died during delivery. The operation was undertaken for a low attachment of the placenta. In some of the cases severe hemorrhage occurred; in others, no great amount of blood had been lost.

Fry urges in his paper that bipolar version, often known as Braxton Hicks', has been neglected in the treatment of placenta prævia. Much of the modern teaching favors rapid dilatation, podalic version, and rapid delivery. The argument which supports this treatment is based usually upon the supposed better chance for the child's life. The risks to the mother, however, are considerably greater. A large number of children are lost by this method.

The Induction of Labor for Contracted Pelves.—SCHOEDEL reports, from the clinic in Dresden, 41 cases of induced labor occurring in 15,627 cases of labor, a ratio of 1 in 381 (*Archiv für Gynäkologie*, 1901, Band lxiv., Heft 1). This is a low percentage, as many writers upon the subject in other clinics give a ratio of 1 to 131 or 1 to 176.

Among the cases there were 5 of symmetrically contracted pelves, 27 of flat rhachitic pelves, 8 of simple flat pelves, and 1 of obliquely contracted pelvis. The smallest true conjugate for which the operation was performed was 7½ cm. The largest true conjugate was 9½ cm. The average period of gestation was thirty-five weeks and three and one-half days. The longest gestation was thirty-seven weeks and five days, and the shortest thirty-three weeks and two days. The average length of the children was 47.1 cm., and the average weight 2527 grammes. Especial attention was given to cases in which the induction of labor seemed necessary. During the last two months of pregnancy these patients were kept constantly under observation. They were often examined once or twice each week in the clinic or at their homes. The comparative size of the fœtal head and the pelvis was carefully estimated.

There were 35 vertex presentations among these cases, 4 transverse presentations, 1 breech presentation, and 1 oblique position of the head. Of the children in vertex presentation 14 were spontaneously delivered and survived; 4 perished a few days after labor. Of those born spontaneously 71.4 per cent. were discharged in good condition. Of the children that perished, inspiration pneumonia was found in 1 case, subpleural and subpericar-

dial hemorrhage, with collapse of the lung, in another, intracranial bleeding in the third from long-continued labor, and also in the fourth because of the premature escape of the amniotic liquid. The child born in breech presentation survived.

In 26 cases labor terminated by operation. Version was done twenty-five times and the forceps used once. Of children born by version and extraction 56 per cent. were discharged in good condition, the remainder dying within two or three days after birth. While it is true that the child has the best chance for life when presenting by the head, this does not obtain when labor is unduly prolonged. The effort was made in each case to secure birth with the head presenting. When this could not be done, version was made early in labor, just before the membranes ruptured or immediately afterward. The only case in which forceps were used when the head was presenting was one in which tympany of the uterus suddenly developed after the head entered the pelvis. Mother and child recovered in this case. In the case in which the child presented with the head obliquely across the pelvis the child perished two days after delivery, and an indentation of the cranium with intracranial hemorrhage was found upon autopsy.

The indications for version in vertex presentations were prolapse of the cord in 4 cases, irregularity of the fœtal heart in 1, and an unfavorable position of the head in 14. In 1 placenta prævia required version before dilatation was complete. Craniotomy was also done in this case. In all of the 41 cases 35 children were born living and 6 were stillborn. During the first ten days after labor 9 of the children born living died; 63.4 per cent. of the children were discharged from the hospital in good condition. Of the mothers, 39 of the 41 were discharged recovered; 1 perished in the clinic with acute anæmia, atony of the uterus, and weakness of the heart. In the second case the husband insisted upon taking the patient to her home against the advice of the physicians. Symptoms of thrombosis were present, and the patient died of embolism before reaching the railway station. The maternal mortality in the series was 2.4 per cent. Three patients had continued high fever, one from pneumonia, the second from thrombosis, and the third from gonorrhœa, as gonococci were found in the vaginal secretion before the induction of labor.

The method of inducing labor was the introduction of the bougie, followed by the use of an elastic bag. A bougie is inserted and allowed to remain for twenty-four hours, when, if pains do not occur, a second is inserted. During the next twenty-four hours the cervix usually dilates sufficiently to introduce one or two fingers. An elastic bag is then introduced, and from 250 to 500 cubic centimetres of fluid is inserted. The average duration of labor by this method was forty-one hours and one minute.

In the care of the children the use of the incubator was found of great advantage.

An Unusual Form of Perineal Laceration.—ZANGEMEISTER (*Centralblatt für Gynäkologie*, 1901, No. 31) describes two cases of unusual laceration of the perineum which occurred in primiparæ in spontaneous delivery. A transverse tear first occurred between the anus and the vagina, and then above this the mucous membrane of the vagina was separated from the

perineum and from the tissues at the sides of the vulva. The laceration extended almost to the urethra upon one side. The transverse laceration above the bowel did not communicate with the vagina. Both cases were treated by suture, but union did not occur. Secondary suture on the ninth day was also unsuccessful. After recovery from labor operation was successfully performed.

The Treatment of Puerperal Septic Infection.—BUDIN (*L'Obstétrique*, July 15, 1901) reports his results in the treatment of puerperal septic infection. His material embraced 33 cases brought to the hospital from outside, and 59 cases having rise of temperature among patients confined in the hospital. Of the first series of 33 washing out the uterus, with digital exploration, was sufficient. In 13 cases he had recourse to a prophylactic curetting, and in 16 cases he made digital exploration and used the écouvillon. This instrument is a swab or brush which is passed thoroughly over the mucous membrane of the uterus to remove débris. Of the 33 cases 1 died and the remainder recovered.

Of the 59 who had fever contracted within the hospital, in 5 digital exploration and douching were sufficient. In 54 digital exploration and the use of the écouvillon were practised. None of these patients died, but all made speedy recoveries.

Lymphangitis of the Breast, and Galactophoritis.—MAYGRIER (*L'Obstétrique*, July 15, 1901) reports 2432 cases of labor, of which in 139 cases the breast was infected, making 5.71 per cent. of the cases. Lymphangitis was limited in 61 cases to one breast only; in 25 both were attacked, and in 2 first one breast and then the other. The disease appeared at any time from the third to the twenty-fifth day, usually between the third and ninth. Patients were taken with inflammation of the breast who did not nurse the child as well as those who attempted to nurse their infants. In lymphangitis the attack of inflammation came on suddenly, with chill and fever, which rapidly abated. In galactophoritis, or inflammation of the milk-ducts, the progress of the case was slower, the disease developed very gradually, and there was usually no chill. The disease was insidious in its development. Infection of the lymphatics rarely returned, while infection of the milk-ducts would occur frequently in the same patient. A superficial lymphangitis usually terminated by resolution. Abscess was rare in both cases with intelligent treatment. Diagnosis is made by palpation, by observing the discoloration of the breast, and by examining the milk. These cases arise in women who have fetid lochia, in overcrowded and foul wards, and who have wounds and fissures in the nipple. Of the two lymphangitis is less severe and much shorter.

The treatment consists of strict antiseptic precautions and strict asepsis in the care of the breasts. The nipples and breasts are covered with sterile gauze. Boric acid compresses are used before and after nursing. The child's mouth is cleansed with boric acid solution, and the hands of nurses and attendants are made scrupulously clean. Cracks in the nipple are treated by compresses wrung out of alcohol and water, 1:5, or by a saturated alcoholic solution of orthoform. When the patient is attacked by galacto-

phoritis she is immediately isolated, and the child is removed from the breast. In lymphangitis the treatment consists of compresses of boric acid solution, and warm applications, which are usually successful. In galactophoritis aseptic compresses are used, the milk is gently removed from the breast by expression if possible, and abscesses are promptly opened and drained.

The Metabolism of the Newborn.—CRAMER (*Archiv für Kinderheilkunde*, 1901, Band xxxii., Heft 1 and 2) has made a series of careful experiments to determine the metabolism of the newborn child and the circumstances which influence it most profoundly. He finds that newborn children obtain from the mother but little water during the first days of life. Unless the child is given water the secretion of urine is lessened and gradually increases as the secretion of milk becomes established. From the tenth day on in children well developed and well nourished the daily quantity of urine approximates 70 per cent. of the fluid taken.

The formation of gas in the intestine in newborn children occurs at intervals of about two hours. Soon after birth, from feeble metabolism and reflexes and because little water is taken, much less gas is formed than later in life. After the first ten days of life the activity of metabolism increases and gas is formed more freely.

GYNECOLOGY.

UNDER THE CHARGE OF

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Cancerous Degeneration of Fibromyomata.—HEGAR (*Centralblatt für Gynäkologie*, 1901, No. 27) reports seven cases of combined carcinoma and fibromyoma of the uterus. The capsule of the fibroid seems to oppose a certain barrier to the advance of the cancer. As soon as the capsule has been destroyed the malignant disease spreads rapidly through the fibromuscular tissue. Only two cases have been recorded in which epithelial ingrowths developed in the centre of a fibroid, nor were they clearly demonstrated as evidence of actual malignant degeneration of the benign tumor. It has not been proved that the presence of fibroids favors the development of cancer. The expressions "myocarcinoma" and "cancerous degeneration" of a fibromyoma should be discarded.

Resection of the Uterus for Displacements.—MAUCLAIRE (*Annales de Gynécologie et d'Obstetrique*, vol. lv., No. 28) advises the following plan of treatment for persistent anterior or posterior displacements where there is no

disease of the tubes or ovaries requiring their removal. A wedge-shaped piece is removed in the median line from the anterior and posterior walls of the uterus, the portion resected being about half a centimetre in depth and the width depending on the displacement to be corrected and extending from the fundus to the vaginal junction. The cut surfaces are brought together with interrupted sutures placed at right angles to the long axis. Very little hemorrhage occurs. It may be necessary to shorten the round ligaments or resect the sacral ligaments in order to assure a complete reduction of the displacement.

Preliminary dilatation and curettage, and, when needed, repair of the pelvic floor should be practised in all cases.

Leucoma or Leucoplakia of the Vulva.—BUTLIN (*The British Medical Journal*, July 13, 1901) reports four cases in which leucomatous areas, similar to those found on the buccal mucous membrane, occurred on the mucous membrane of the vulva. The patients were all past the climacteric—one, aged sixty-six years; another, seventy-three years. No symptoms were produced until ulceration had occurred in one or more of the plaques. Microscopic examination in three of the cases, of sections from the ulcerated areas, showed them to be true epitheliomata. The fourth case passed from observation before sections were made, but undoubtedly died from malignant disease.

Removal of the ulcerated areas, together with the leucomatous plaques, was the treatment in three cases.

Necrosis of Cervix Uteri Following Supravaginal Hysterectomy.—REGALL (*The British Gynecological Journal*, vol. xvi., No. 63) performed hysterectomy for multiple fibroids complicated by numerous and firm adhesions. The patient suffered greatly from shock, so that the operation was completed in haste, the cervix being divided some distance above the point of ligation of the uterine arteries. The patient did well until the fifth day when her temperature began to rise, and on the seventh day reached 102° F. There was a profuse, dark-colored, foul-smelling discharge from the vagina, and on the tenth day a slough was passed per vaginam. This consisted of a disk of cervical tissue. The patient recovered.

MacNaughton-Jones reported a similar experience following supravaginal hysterectomy for uncomplicated myoma. The patient did well until the fifth day, when her temperature rose, and some time later a large mass was passed per vaginam, which was found to be the stump of the cervix with six sutures attached. The patient made a good recovery.

Double Vagina and Uterus.—ROBB (*Cleveland Journal of Medicine*, vol. vi., No. 6) reports a case of this comparatively rare condition. The patient, aged twenty-three years, unmarried, complained of dysmenorrhœa, backache, and pain in the lower abdomen. The catamenia began when she was sixteen, had never been regular, occurring every five or six weeks, were scanty in amount, and lasted about two days. Examination under anæsthesia showed the following condition: On separating the labia an irregular band of tissue was seen extending from the posterior to the anterior wall of the vagina.

This septum was to the right of the median line, dividing the vagina into two unequal cavities, the opening to the left being about normal in size, that to the right large enough to admit the index finger. The cervix on the left side was far back in the vagina, and the posterior portion of the vagina was much contracted, barely admitting two fingers. A distinct cervical opening could be felt. The same condition existed in the right cavity. The septum between the two cavities was quite thick, measuring 1 cm. at the vaginal opening. Both cavities had a depth of 8 cm.

Sounds passed into the cervical openings showed that there were two uterine cavities having a depth of 7 cm. and separated by a thick ridge of tissue. The uterus was freely movable. The adnexa could not be clearly defined.

An exploratory abdominal section was made. The uterus was found to be small, but otherwise normal externally. The outlines of the fundus were regular. Both ovaries were freely movable and contained a number of Graafian follicle cysts. After closing the abdominal wound the vaginal septum was divided. The uterus was then drawn down and the uterine septum divided. The uterine cavity was curetted and packed with gauze. The endometrium was very scanty, and microscopically showed a condition of chronic interstitial endometritis.

Ovarian Organotherapy.—KRUSEN (*Johns Hopkins Hospital Bulletin*, vol. xii., No. 124) after the use of ovarian extract in three classes of cases—(1) those suffering from amenorrhœa, dysmenorrhœa, and other forms of pelvic disease; (2) those suffering from the vasomotor changes, the cardiac neuroses and depression following the removal of the uterine appendages; (3) those suffering from the disturbances of the natural menopause—reaches the following conclusions:

1. Administration of ovarian extract is practically harmless, even full doses having no untoward effects beyond slight nausea. 2. No beneficial results were obtained in amenorrhœa or dysmenorrhœa. 3. The best results were obtained in the second class of cases when in a few instances the congestion and nervous symptoms due to the artificial menopause were apparently ameliorated. 4. No appreciable effect was noticed from the use of the extract in the natural menopause. 5. No definite or exact reliance can be placed upon ovarian extract, as it often proves valueless where most positively indicated, and when it does seem to have effect increase in dosage has little influence in maintaining that effect or preventing the patient from becoming accustomed to its use. 6. It is extremely problematical, considering the neurotic type of patients demanding treatment, whether, where good effects were noted, the result was not due to mental suggestion rather than to any physiological action of the drug.

Phlebitis Complicating Supravaginal Amputation.—VERDELET (*Journ. de Méd. de Bordeaux*, 1901, No. 271) reports two cases of phlebitis developing two and four weeks after supravaginal amputation of the fibroid uterus, and infers that the relatively greater frequency of this complication following this operation as compared with total extirpation may be due to the presence of a mild septic infection which is favored by the absence of drainage.

[In our experience the occurrence of phlebitis after abdominal section is in no way dependent either upon the extent of the operation or upon the method adopted. Nor can it always be proved that it is of septic origin. —ED.]

Preclimacteric Hemorrhages.—THEILHABER (*Archiv für Gynäkologie*, Band lxii., Heft 3) takes issue with Czunpin regarding the cause of hemorrhages before the menopause, who believes that they are due to irritation of the endometrium secondary to disease of the adnexa, while the writer affirms muscular atony is the prime cause. The rapid growths of fibroids sometimes observed near the climacteric is doubtless due to the hyperæmia resulting from this condition of atonicity. This is favored by the increase of connective tissue and muscular atrophy observed in the uteri of women over forty.

Hyperplastic endometritis is a common result of this imperfect muscular contraction, hence the great tendency to recurrence after thorough curettement in this class of cases.

Radical Operation for Carcinoma Uteri.—MACKENRODT (*Centralblatt für Gynäkologie*, 1901, No. 27) emphasizes the fact that during the twenty years in which vaginal hysterectomy has been the accepted method of treating cancer of the uterus, only 10 per cent. of the patients thus treated have been cured. This poor result has been due to the fact that the operation has not been a radical one. Since early metastases occur in the vagina, broad ligaments, and glands, only a complete removal of these can insure against a recurrence.

The writer has hitherto employed igni-extirpation. Out of 39 patients 31 still survive, 18 of whom were perfectly well at the end of from three and a half to six and a quarter years. Only 11 cases were suitable for a radical operation. Of these 8 (72.8 per cent.) were cured, there being no deaths. Of the inoperable cases 7 died, 10 had a recurrence, and 10 patients were well after the lapse of over three years. These results, the writer claims, are much better than those obtained by any other method. In order to make the operation more radical he advises the abdominal route, with extensive removal of the gland, parametric tissues, and upper half of the vagina under strict precautions to avoid septic infection and inoculation of raw surfaces with cancer cells. His modified technique is as follows : A large crescentic abdominal incision is made, extending from one iliac spine to the symphysis, and upward to the opposite spine; the insertions of the recti muscles are divided, and the peritoneum (without incising it) is separated from the abdominal opening as high as the umbilicus. The abdominal muscles are then separated from their pelvic attachments, so that a large gaping wound is made. The peritoneum is now opened by a free transverse incision near its reflexion over to the anterior wall of the bladder, the uterus is drawn out, and the ovarian arteries ligated in the usual manner. The posterior edge of the peritoneum is now sutured behind the uterus from the right side of the pelvis across to the left, covering the sigmoid flexure. This allows the subsequent steps of the operation to be conducted extraperitoneally. The pelvic peritoneum is directed upward, carrying with it the ureters as high as the iliac vessels, where the glands are found and removed with the

surrounding fat and connective tissue. The ureter must be carefully protected. Peritoneal openings are sutured. The bladder and rectum are next separated, and the entire vagina freed. Then the broad ligaments and paravaginal tissues are separated; the vagina is clamped and divided with the cautery below the clamps. In this case neither instruments nor raw surfaces come in contact with cancerous tissue during the operation.

The short flap of peritoneum attached to the bladder is sutured to the peritoneum posteriorly, so that the pelvis is completely shut off from the general cavity and can be drained per vaginam. The space between the bladder and abdominal wall is drained through the lower angle of the external wound. The writer insists on the fact that no single point in his technique must be omitted in order to prevent general infection. Extensive suppuration of the large cavity between the rectum and bladder is to be expected.

Six successful operations are reported.

DERMATOLOGY.

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Anomalous Squamous Dermatoses, Especially Psoriasis.—CASOLI (*British Journal of Dermatology*, March, 1901, p. 104) arranges the scaly diseases of the skin into three main groups. I., the hyperkeratoses, of which ichthyosis is an example; II., the keratolyses, such as pityriasis, and III., the parakeratoses, typified by psoriasis. The author takes the position that psoriasis is not always marked with the so-called typical eruption, and gives the following deviations constituting varieties: (1) Eczemaboid psoriasis, which is closely related to so-called seborrhœic eczema; (2) pityriasiform psoriasis, allied to pityriasis rubra; (3) "varicose" psoriasis, or psoriasis cheloidia; (4) lichenoid psoriasis; (5) psoriasis follicularis; (6) papillary fungoid psoriasis, and (7) rupioid psoriasis. In addition certain anomalies of distribution are noted, as (1) inverted psoriasis, affecting flexor surfaces; (2) circumscribed psoriasis, and (3) psoriasis of mucous membranes. Reference is also made to cases originating in traumatism, after vaccination, and due to nervous influences.

A Peculiar Case of Dermographism (Chronic, Factitious, Hemorrhagic Urticaria).—T. FABOG (*Archiv für Derm. and Syph.*, 1900, vol. liv.) describes a case differing from the usual form in that hemorrhage instantly appeared in the wheals produced. The urticaria quickly disappeared, but purplish

bands remained for weeks, which underwent the usual changes of color met with in extravasated blood. The lesions were always traumatic, though the exciting cause was often insignificant. Even the palms and soles were the seat of lesions. The nervous system appeared to be healthy. The patient died of exhaustion.

Cutaneous Diseases Accompanying Diabetes.—HARTZELL (*Journal of the American Medical Association*, January 26, 1901) calls attention to a number of manifestations on the skin met with in diabetes, among them diminution of the sweat and sebaceous secretions, accompanied by generalized itching and pruritus of the genitalia, arms, and thighs. Various forms of erythema, and sometimes chronic urticaria, also occur, while eczema is one of the commonest complications, frequently located about the genitalia. Pruritus and eczema may prove to be the first symptoms of eczema, occurring in individuals who suffer either from thirst or polyuria. The furuncles, carbuncles, and gangrene met with do not differ from those due to other causes. The eruption of a peculiar form of xanthoma, consisting of firm, yellowish-red, rather flat papules disseminated over the arms, legs, and buttocks, is almost pathognomonic of the disease.

Veld Sore.—S. GUISE MOORES (*British Medical Journal*, May 4, 1901, p. 1078) states that this peculiar form of sore is prevalent in South Africa all the year round, and that officers and men in the British regiments have suffered alike. An abraded surface appears to be essential for its production, whether it be due to a sun blister, bite of an insect, or an abrasion. Of its specific bacterial origin there is no doubt, the micro-organisms being present in water, and washing secures its entrance. The fact of its presence on the hands, and next in frequency the face and feet, tends to this view. It is auto-inoculable. The ulcer usually begins as a blister, becoming rapidly pustular, the walls bursting and leaving a red, irritable-looking ulcer with depressed surface. It spreads marginally until arrested by treatment. The natives of South Africa are exempt, and dark-haired Europeans seldom contract the sore, but those with light or red hair seldom escape. Strong carbolic acid followed by corrosive sublimate lotion (1 : 3000) is an effective treatment.

Vaccinal Lupus.—E. G. LITTLE (*British Journal of Dermatology*, March, 1901) gives an interesting article on this subject supported by a case of his own and cases of other observers. The authentic cases on record, however, are not numerous. The author believes with Payne that cases will be more frequently observed as attention is directed to the subject.

The Bacillus of Leprosy.—BARRANIKOW (*British Journal of Dermatology*, March, 1901, p. 108) from personal studies expresses his opinion that the life-history of the bacterium lepræ is an extremely complicated affair. Animals are not receptive to the microbe in all its forms of development. In one phase it loses its specific stain (Ziehl-Neelsen method), not only when passed through 1 per cent. of sulphuric acid solution, but when water only is used, although its clinical characteristics remain the same.

Formalin in the Treatment of Lupus.—W. SCATCHARD (*British Medical Journal*, May 4, 1901, p. 1078) reports a case of lupus of the nose of five years' standing in which the application of equal parts of formalin (formic aldehyde, 40 per cent.) and glycerin, preceded by orthoform powder to lessen the pain, acted very happily. There were during the following year at or near the original lesion slight recurrences, all of which disappeared under the same treatment. If orthoform was applied about an hour before the painting, there was no pain. The resulting scar caused very little disfigurement.

Alopecia Areata.—E. J. EMERICK (*Columbus Medical Journal*, February, 1901) cites several cases under his observation that were benefited or cured by applications of chrysarobin ointment, 10 to 15 per cent. strength, used daily for a week or ten days, followed by pure carbolic acid applied lightly with a swab. The ointment referred to sets up considerable inflammation, and must be used cautiously. When this inflammation has subsided areas here and there the size of a silver dollar are touched from time to time with the acid. The results in the cases given were highly satisfactory.

Koplik's Spots: Their Value in the Diagnosis of Measles, Particularly in Private Practice.—J. ZAHORSKY (*Maryland Medical Journal*, April, 1901) still adheres to his statement, made some time ago, that Koplik's sign is found only in connection with measles, and when present is a pathognomonic sign of that disease. These lesions (as is now well known) consist of minute bluish-white spots, very slightly elevated, and situated in an inflammatory base. At the beginning of the buccal exanthem irregular areas of congestion are visible, which soon become more or less confluent, forming irregular patches. After two or three days of prodromal fever the exanthem is well defined, constituting the efflorescence of measles on the mucous membrane analogous to that on the skin. The exanthem on the mucous membrane is not diagnostic until the bluish-white spots appear. They are composed principally of epithelial cells, being a furfuraceous desquamation of the mucous membrane, entirely analogous to that of the skin. They have not met with it in other eruptive diseases. Daylight is necessary to obtain a good view of them. They are not always present, but when absent all the symptoms and signs, with the history of the case, must be considered before measles can be excluded. It should be remembered that the earliest sign of measles is the typical efflorescence on the mucous membrane. If the postcervical glands are enlarged and the prodromal fever has been very short, and there is no trace of Koplik's spots, the disease may be diagnosed as rubella; but if the prodromal fever lasts three or four days and the glands are only slightly enlarged, the disease may be assumed to be measles, even if the spots are absent.

The Blood in Epidermolysis Bullosa Hæreditaria.—T. R. BROWN (*Maryland Medical Journal*, April, 1901) found in the blood counts 11,000 leucocytes per cm., of which 42 per cent. were polymorphonuclear neutrophiles, 40.6 per cent. small mononuclears, 7.7 per cent. large mononuclears and transitional forms, and 9.7 per cent. eosinophiles. There was thus a moderate eosinophilia, the eosinophiles being all of the polymorphonuclear variety.

This agrees with the results given by Colombini. The conditions of the blood and the contents of the vesicles harmonize with what might be expected from the pemphigoid character of this disease, namely, that there is both a general and a local eosinophilia, although of moderate degree. Neusser, Gallasch, and Lukasiewicz first called attention to the great number of eosinophiles in the blebs of pemphigus, but these cells are met with in various bullous as well as in certain vesicular lesions, especially in recent lesions.

Syphilitic Lesions of the Wheal Type.—H. G. KLOTZ (*Journal of Cutaneous and Genito-urinary Diseases*, February, 1901), after calling attention to the well-known observation that syphilis may imitate almost any of the non-syphilitic diseases of the skin, cites some cases of his own in which urticaria was simulated, the forms of eruption being neither macular nor papular, but pemphigoid or wheal-like, without subjective symptoms. In one case the lesions seemed to be of the nature of a relapse upon the site of a previous ordinary early syphilitic macule. The author regards these lesions not only as rare, but different from the syphilitic lesions usually described in the books.

Rochard's Ointment in the Treatment of Psoriasis—BLASCHKO (*Dermatologische Zeitschrift*, Band viii., Heft 3), at a meeting of the Berlin Dermatological Society, directed attention to the excellent results obtained from the use of an old remedy, Rochard's ointment, in psoriasis. This ointment consists essentially of a mixture of the green and red iodides of mercury obtained by mixing iodine with calomel; it is prepared according to the following formula: Iodine, 6 parts; calomel, 1.8 parts; vaseline or suet, to 100 parts. Blaschko usually adds to the mixture some ether or alcohol. According as alcohol is added or not and the mixture is heated slowly or rapidly the color of the ointment varies. While in a certain number of individuals the ointment may cause irritation, in a large number of cases of psoriasis the eruption may be made to disappear without any, or with very slight, irritation of the skin. In a certain number of cases the author has found the remedy preferable to chrysarobin.

Atypical Corneous Formation.—HERXHEIMER and HILDEBRAND (*Archiv für Dermatologie und Syphilis*, Band lvi., Heft 1) describe certain peculiar hitherto undescribed structures found by them in the cells of pavement-celled carcinoma of the skin. They were usually round, sometimes oval, or less frequently crescentic in shape, the crescent-shaped bodies covering the half of the nucleus of the cell like a cap. They were situated in the cell protoplasm at a distance of 1 to 2 microns from the nucleus; occasionally they were near the periphery, without, however, being in contact with the cell-mantle. The size varied considerably, the round ones being from 3 to 5 microns in diameter, while the oval ones were larger, measuring from 6 to 7 microns in diameter. As a rule, but one body was found in a cell, but occasionally two were seen, and not more than every third or fourth section examined contained them. They were found exclusively in cells in the neighborhood of epithelial "pearls." Intense cornification seemed to be a

condition indispensably necessary to their production. The tinctorial properties of these structures showed them to be composed of corneous material similar to the corneous cells of the epidermis.

Bullous Urticaria.—MALCOLM MORRIS (*British Journal of Dermatology*, May, 1901), at a recent meeting of the Dermatological Society of London, presented a case of urticaria occurring in a female infant, aged thirteen months, in which, in addition to urticarial wheals, large bullæ were present upon the back. When the child first came under observation the bullæ were distributed over the trunk, limbs, and scalp. The infant was in other respects healthy. LITTLE (*Ibid.*, July, 1901) at a subsequent meeting exhibited an infant, eleven days old, in whom there was an eruption of bullæ varying in size from a quarter to one-half inch in diameter upon a generally erythematous skin. There were also isolated bullæ in both axillæ, in the suprapubic region, on the backs of the thighs, the cheeks, forehead, and genitalia. At the same time there were small urticarial papules on the arms, palms, soles, shoulders, and cheeks. Apart from the cutaneous affection the child was healthy.

DISEASES OF THE LARYNX AND CONTIGUOUS STRUCTURES.

UNDER THE CHARGE OF

J. SOLIS-COHEN, M.D.,

OF PHILADELPHIA.

Laryngeal Whistling.—DR. G. HUDSON MAKUEN reported to the Section on Laryngology and Otology (*Journal of the American Medical Association*, 1900) two cases of laryngeal whistling, one of which he was able to study with the laryngoscope, and found that the lips of the superior aperture of the larynx were pursed in the same way as the lips of the mouth are pursed in ordinary whistling.

Two Cases of Ligation of the External Carotid for Severe Hemorrhage, One after Tonsillotomy, the Other after a Slight Intranasal Operation.—DR. W. W. KEEN reports (*Annals of Surgery*, July, 1901) two cases of secondary hemorrhage resisting the usual measures of repression. Both cases made good recovery. The nasal operation consisted in curetting hypertrophies of the posterior portion of the nasal septum.

Historic Records.—DR. JONATHAN WRIGHT, of Brooklyn, N. Y., has begun a series of papers (*The Laryngoscope*, July and August, 1901) on the nose and throat in the history of medicine, thus far having touched upon the medicine of the Egyptians, Chaldeans, the Parsees, the Jews, the Hindoos, the Grecians, and the Romans.

Suppurative Parotitis.—Dr. Francis R. Packard reports (*Journal of the American Medical Association*, August 17, 1901) two cases of suppuration of the parotid gland, with pus in the external auditory canal, a condition which he believes must be frequently overlooked by the general practitioner and by others who have not made a special study of the subject, the pus being regarded as coming from the middle ear instead of reaching the parts as it does do by infiltration through the incisuræ Santorini.

Diseases of the Maxillary Antrum.—Dr. W. E. Casselberry, of Chicago, reports two cases of serous disease of the maxillary antrum (*The Laryngoscope*, July, 1901) and discusses the subject in its general aspects, giving a bibliography of its literature. He concludes that the diagnosis of accumulation of serum in the antrum without its distention or deformity must be based upon aspiration, the transillumination test being indecisive. The discrimination of a free collection of serum from a cyst may be quite impracticable, even when the sinus has been widely opened, and sometimes it has been impossible to determine the point even on autopsy. The treatment may consist in removing any polypi, resecting enlarged middle turbinated bodies, removing any other obstruction of the opening of the orifice of the sinus, with due perforation for drainage. Should this fail an opening in the anterior wall of the sinus should be made sufficiently large for palpation, and then curetting would seem to promise a cure and perhaps forestall what would ultimately become an empyema.

Osteoma of the Frontal Sinus.—Dr. W. D. Hamilton, of Columbus, Ohio (*Journal of the American Medical Association*, January 26, 1901) reports two cases in males, aged respectively thirty-six and twenty-seven years. In the latter case the neoplasm was of softer consistency, and was complicated with polypoid growths and a rather extensive suppuration. Recovery followed operation in both instances.

Syphilis of the Lymphoid Tissue in the Base of the Tongue.—Dr. G. Hudson Makuen, of Philadelphia, reports (*Journal of the American Medical Association*, August 17, 1901) a case in which the tertiary manifestations were confined entirely to this tissue, and Dr. Casselberry, of Chicago, in opening a discussion upon a paper which was read at the last meeting of the American Medical Association, mentioned a similar case in which, from a mistaken microscopical examination, a large mass had been removed after pharyngotomy, under the supposition that it was a case of carcinoma. Dr. Stout, of Philadelphia, referred to a case in a trained nurse who had caught the original infection by sucking milk from an abscessed breast.

Morbid Growths of the Palate.—Dr. William F. Dudley, of Brooklyn, N. Y., reports (*The Laryngoscope*, August, 1901) an unusual case of papillomatous growths of the soft palate in a man, aged seventy-one years. They were successfully removed with the wire snare.

Coincident Follicular Tonsillitis and Diphtheria.—Dr. William P. Munn, of Denver, reports (*American Medicine*, September 7, 1901) a case in

which diphtheria affected one tonsil, and follicular tonsillitis the other. It does not appear, however, that the diagnosis in the latter instance had been verified by microscopic inspection of the exudate.

A Snare Guard for Ecrasement of the Tonsils.—Dr. Otto T. Freer, of Chicago (*Journal of the American Medical Association*, August 17, 1901) presents a snare guard for Ingals' operation after ecrasement of the tonsils, which facilitates the effective use of the loop. The wire is enclosed in a ring which is passed over the mass as it is held in the grasp of the forceps.

Typhoidal Laryngitis.—Dr. D. J. Gibb Wishart, of Toronto, Canada, reports (*Philadelphia Medical Journal*, September 7, 1901) a case of typhoidal ulceration and abductor paresis of the larynx which required tracheotomy. The patient recovered.

Some investigation into the literature of the subject follows a report of the case.

Thuja in Papilloma of Larynx.—Every now and then some drug is lauded as topically effective in growths of the larynx. Now it is alcohol, again magnesia sulphate, and what not. Dr. James Moreau Brown reports successful results from tincture of thuja-arbor vitæ applied with a cotton swab (*Journal of the American Medical Association*, August 3, 1901.)

Thuja has been recommended internally for the same purpose, as have likewise magnesium sulphate and other drugs.

The fact is that spontaneous retrogression sometimes takes place in papillomas of the mucous membranes, in some instances in sequence to any abrasion or injury which may disturb the equilibrium of the circulation within them.

Fracture of the Larynx.—Dr. Arthur W. Watson reports (*The Laryngoscope*, July, 1901) a case of stenosis of the larynx following fracture, with recovery after operation. A boy, aged sixteen years, while riding his bicycle ran into the tail-board of a wagon, striking the thyroid cartilage. Six weeks later dyspnœa ensued, which was found to be apparently due to adhesion between the ventricular bands. These were separated, yielding but slight relief, and an O'Dwyer intubation-tube was then introduced. Five months after the injury a preliminary tracheotomy was performed, and three weeks later laryngo-fissure. The stenosis was found to be due to a great deal of redundant tissue, which was cut away from the wall of the larynx and shelled out without injury to the soft parts within. The patient was dismissed, still wearing the tracheal canula, and this was subsequently removed a couple of weeks later. The voice became clear and strong, and the breathing perfectly free.

Foreign Bodies in the Larynx.—In the course of an article detailing a number of curious cases of foreign body in the larynx, Dr. J. Garel, of Lyon (*Annales des Maladies de l' Oreille du Larynx, etc.*, August, 1901), recommends and depicts an electro-magnetic extractor for extracting metallic bodies which might be likely to slip from the grasp of the forceps. This

instrument is modelled upon the similar extractor of Wetherla, originally designed for the extraction of O'Dwyer tubes, and will sustain a weight of one kilogramme, so that considerable force can be exercised with it.

Œsophagometry.—Dr. C. D. Spivak, of Denver, recommends (*New York Medical Journal*, August 31, 1901) an intragastric whistle as a new device in measuring the length of the œsophagus in the living subject. A whistle is attached to the distal extremity of a stomach-tube. The whistle blows as it passes the cardiac orifice into the stomach. Its distance from the teeth can then be measured.

PATHOLOGY AND BACTERIOLOGY.

UNDER THE CHARGE OF

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Echinococcus Multilocularis.—Melnikow-Raswedenkow. The fourth supplement of Ziegler's *Beiträge*, 1901 seems to mark a change of policy in the conduct of that series. Unlike the monographs of Pianese on carcinoma, of Hückel on vaccine bodies, and of Sata on mixed infections in phthisis, the present three-hundred-page volume is in the main casuistic. By the co-operation of several (chiefly German and Russian) laboratories, it has been possible to obtain a series of 101 cases in man of the alveolar (or multilocular) type of echinococcus disease. Thorough routine histological study, some comparative work, and a moderate amount of statistics render possible a considerable modification of older views of the disease. Such casuistic work justifies itself, and the supplement series does not suffer.

The parasite which causes the multilocular type of echinococcus disease is not *tænia echinococcus*. In the first place no intermediate host is required. Granted an embryo which gains entrance from the gastro-enteric tract *via* the blood stream to some portal venule beneath the liver capsule, a multilocular chitinous structure then forms wholly resembling the mature proglottis of a tapeworm. From the finely granular protoplasm which lines the chitinous walls, both within and without, there are formed not alone scolices (as from the inner wall of an ordinary or unilocular hydatid), but also young parasite forms (without capsule) and ovoid embryos (with capsule). Such embryos, discharged from the outer surface of the cyst, may fall victims to phagocytosis in tissue spaces, or, if they obtain access to the lumina of bloodvessels or bronchioles, they may there develop fresh chitinous cysts. The new crop of cysts loses in virulence and remains sterile. One is thus reminded of the trematode fashion of developing rather than of the way described for cestodes in general.

Meantime the ready release of embryos from the outer coating of the cyst renders metastasis easy (*e. g.*, to lymph nodes, lung, brain), and produces in

the neighborhood of cysts a type of reaction not far removed from the infectious type. Toxins effect an increased tendency to proliferation, may, indeed, cause more or less local necrosis, and form a kind of granuloma, characterized by the presence of lymphoid cells, epithelioid cells, and giant-cells, with caseous degeneration

More cases occur in Russia than have been supposed, and more than even the present collection (seventy) might suggest. The parasite is of wide distribution upon the Continent, and two forms of parasite have been met with in the same regions.

The details of the method of infection remain unknown, and experimental biology has been perforce deferred. As far as examined, the reactions of man and the lower animals to the parasite present no essential differences.

Histologically, the work is nigh to settling a moot-point. Such differences as the two types are now seen to present were at first thought capable of explanation on the basis of individual tissue differences. It was thus that Virchow had explained the matter. But the discovery of the two kinds in one liver, a great hydatid in the right lobe and an alveolar group, unrelated with the hydatid, in the Spigelian lobe, together with an adequate definition of the two types of growth (such as afforded by the present work), makes it unnecessary to suppose, here at least, such mysterious differences of reaction.

As to technique there is little to say. Melnikow-Raswedenkow prefers formaldehyde fixation, celloidin embedding, and staining with Weigert's elastic tissue stain, followed by either eosin or Van Gieson's mixture and alum-hæmatoxylin. There are some pretty plates, showing, among other things, phagocytosis and the penetration of the elastic membrane by young forms of the parasite in the act of invading a vessel.—E. E. S.

Observation on the Occurrence of Plasma Cells and Mast Cells.—HIRSCHMANN (Virchow's *Archiv*, 1901, clxiv., p. 541) has made a histological study of twenty-five larynges which were the seat either of acute or of chronic inflammation. Cases of tuberculous or syphilitic laryngitis were excluded.

Plasma cells were not found in the normal or in the inflamed larynx. Joannovicz, Unna, and v. Marshalko agree that plasma cells are formed when a strong infectious irritant acts for quite a long time, producing a loss of substance and a destruction of cells whereby chromatin is set free. Unna states that plasma cells are rarely formed by the action of weak irritants, for example, in infectious catarrhs, and then only in small numbers. A loss of substance is ordinarily the sign of a strong, progressive, and long-continued disturbance of nutrition.

Laryngitis is usually due to an irritant which is too weak to produce an extensive destruction of cells. There is generally a marked emigration of leucocytes and proliferation of cells. Without undergoing necrosis these cells are cast off and form part of the secretion. Hirschmann found mast cells in every case. This is in accord with the statement of various writers that mast cells are found especially in those organs which are the seat of a mild but long-continued inflammation. For the demonstration of mast

cells either thionin or aqueous methylene blue gives as good results as polychrome methylene blue.

The mast cells were never very abundant in the cases of laryngitis which resulted from chronic passive congestion. In those of purely inflammatory origin, however, the mast cells were numerous. Although they were scattered diffusely through the mucosa and submucosa they were always present in largest numbers in the neighborhood of the vessels and glands, which were always surrounded by collections of small cells. Normally the tissues of the larynx are infiltrated with small cells, but in pathological conditions this infiltration is increased.

The writer believes that the different forms of mast cells which have been described really represent different stages in the development of the same cell. He makes the following divisions: First stage. Cell elongated; blue the predominating color of the protoplasm; nucleus darker blue and staining intensely; no indication of karyokinesis. One pole of the cell body takes a slightly reddish tinge due to the presence of single red granules. Second stage. The size of the cell increases, and the red tinge gradually becomes more pronounced until at length the entire cell body is composed of red granules. The contour of the nucleus may become indistinct, but more commonly the nucleus remains unchanged. Later some of the granules break through the cell boundaries, and are seen lying free at a greater or less distance from the cell. Last stage. The nucleus has disappeared. An irregular clump of red granules and single scattered granules near it are all that remain of the cell. These three stages are not sharply separated from one another.

Andry and Newberger regard the mast cells as related to the leucocytes, but the direct proof is wanting. Hirschmann claims he has furnished this by the discovery of a mast cell in the act of migrating through the wall of a capillary. Large mononuclear leucocytes, he says, wander into an inflammatory area, and are there converted into mast cells by taking up the products of inflammation. It is these products of inflammation which give the cell its characteristic color. These substances, the nature of which is unknown, are ingested in great amount and lead at length to the destruction of the cell.—J. H. P.

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